THE MODEL ENGINEER

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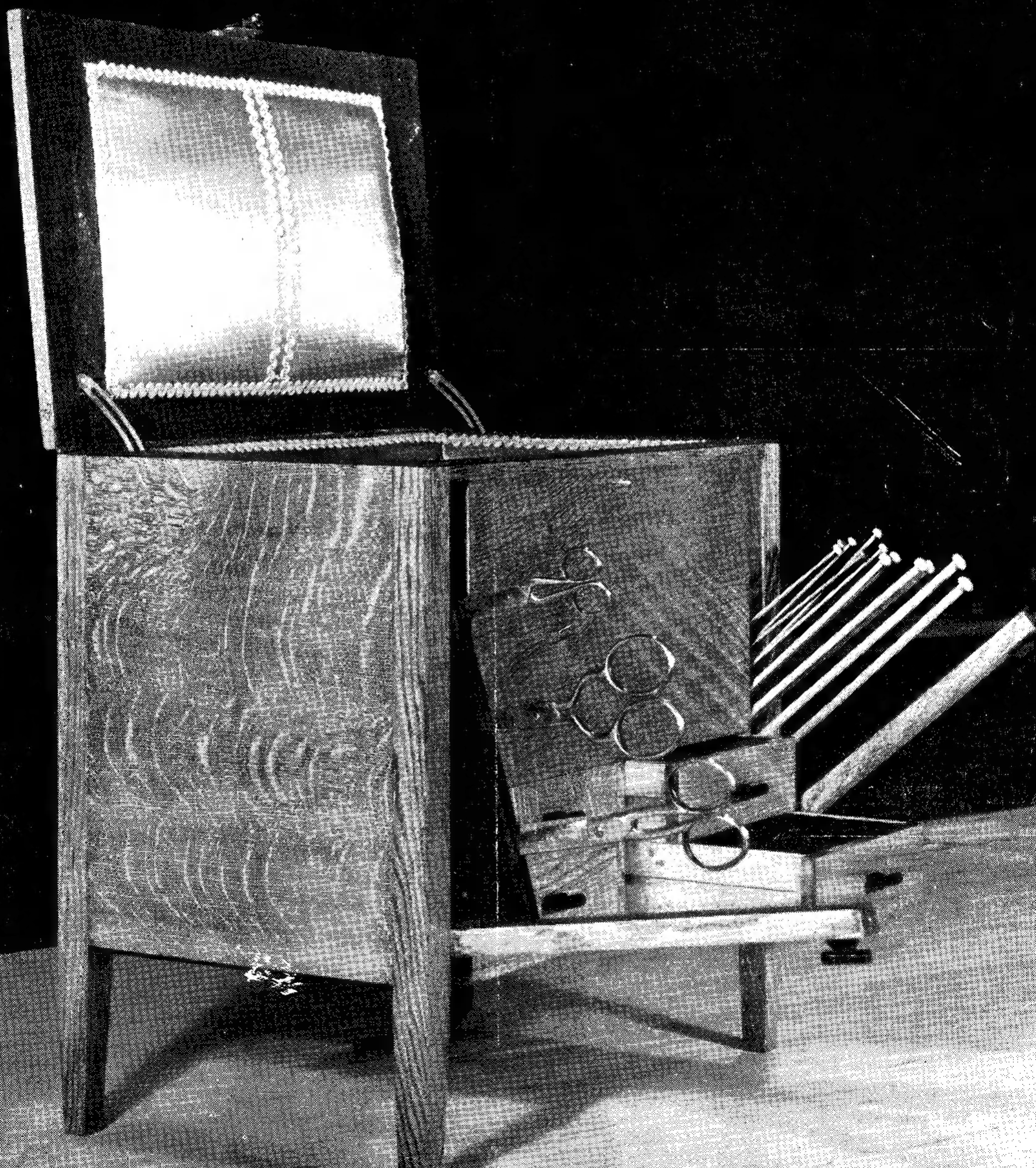


The MODEL ENGINEER

PERCIVAL MARSHALL & CO. LTD., 23, GREAT QUEEN ST., LONDON, W.C.2

18TH MAY 1950 VOL. 102 NO. 2556

SMOKE RINGS

Our Cover Picture

● THE SUBJECT of our cover picture this week may not be strictly model *engineering*, but it is a very striking example of home craftsmanship, from start to finish. It is a needlework cabinet built by Mr. George Malins, of the Kodak Society of Experimental Engineers and Craftsmen. It makes not only a handsome piece of furniture, but even the scissors and knitting-needles were made by Mr. Malins. It was a much-admired entry in the society's recent exhibition, and won a cup specially awarded for pure craftsmanship.

A Churchward Anecdote

● THE RECENT tribute by Mr. K. J. Cook to his former great chief, G. J. Churchward, calls to mind an anecdote which is typical and, we believe, has not previously been published. During the time in 1907, when the design for *The Great Bear* was being developed, it was Churchward's custom to wander round the drawing-office daily, sometimes two or three times daily, to discuss details with everyone from the chief draughtsman down to the newest junior.

One day, he stopped at a board and examined the drawing on it for a minute or more, without saying a word. Then, suddenly pointing to a certain detail, he blurted out sharply, "What have you done *that* for?"

The young draughtsman concerned, who was not quite the newest junior, was momentarily shaken, but replied, "I thought that was what you wanted, sir," and from a pile of papers beside his board he picked up a rough pencil sketch which Churchward himself had made a day or two before.

Churchward carefully compared it with the drawing on the board, and then commented, "Hm. I must be as big a fool as I thought you were"!

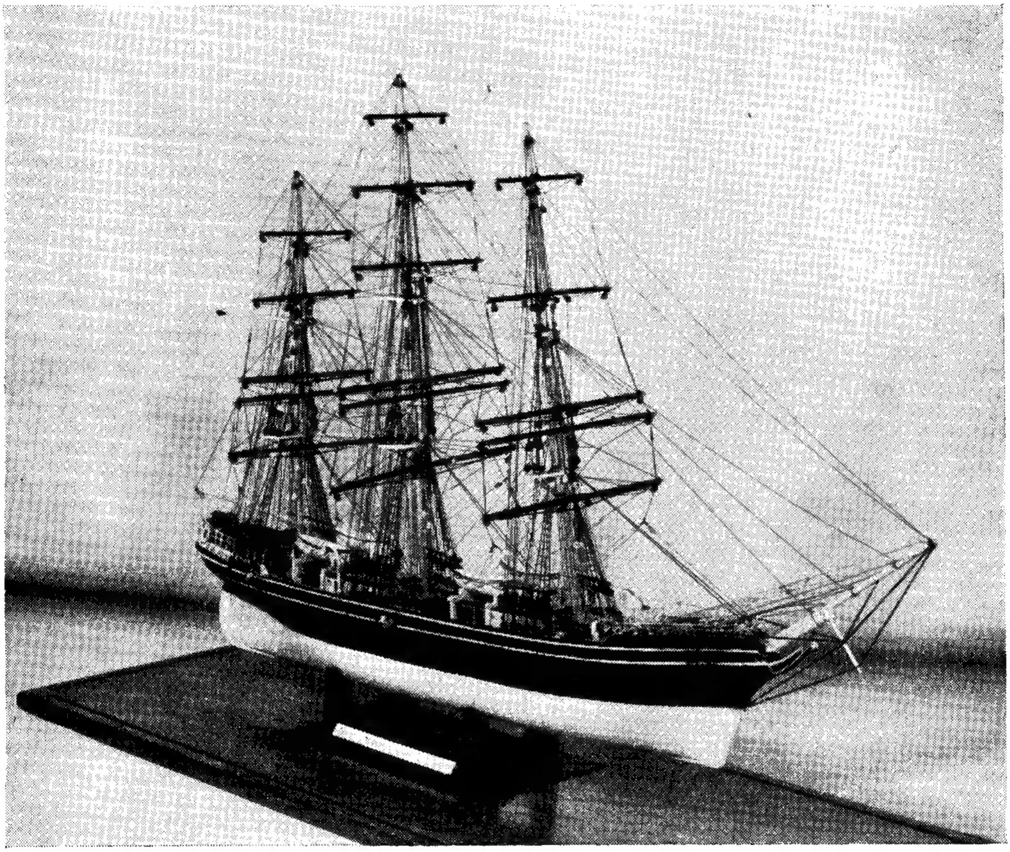
Another Forgetful Reader

● WE HAVE received a letter from Messrs. A. J. Reeves & Co., of Birmingham, to say that they have a letter from a Mr. G. A. Spratt with reference to a Myford M.L.7 lathe. Unfortunately, Mr. Spratt has omitted to give his address, and we are asked to inform him that, if this note should happen to catch his eye and he will forward his address to Messrs. Reeves, his letter will be given immediate attention.

Where Some Model Makers Fail

● WE SOMETIMES come across examples of model making which, while they show plenty of evidence of high-class workmanship and superlative constructional skill, fail to achieve a result that can be regarded as satisfactory, simply because the builder has failed to note certain fundamental details of the prototype that he is copying. It is very seldom that examples of this kind of work can be excused on the grounds that the model is not intended to be a slavish copy of any particular prototype, for that, very often, tends to worsen the opinions of the critic, if it does not actually prove the model maker's lack of knowledge of his subject. We imagine that, when a man sets out to build a model of any kind, he does so because he is interested in the particular subject represented, or has a love for some individual prototype. But his interest in the subject can only be superficial if his model contains errors involving principles of design and construction; neither can his love for a prototype be very deep if the model goes wrong in the main characteristics. No amount of beautiful workmanship can hide fundamental errors, even in a free-lance design.

An instance of the sort of model we have in mind is seen in the photograph reproduced herewith. It is a beautiful piece of work, from the purely constructional point of view; but as a model of the kind of ship it is intended to represent, it falls down rather badly. Its hull lines lack the flow that was so prominent a feature of a square-rigger of this type, while the hollow lines under the quarters are particularly bad. At the other end of the ship, the stem is very ungraceful and the decoration is anything but typical. A figurehead, with nicely flowing scroll was almost universal at the period represented, but is missing from the model. The lifebelt on the poop is too large, as also are the portholes in the fo'c'sle; the rims of these portholes are much too wide. The davits are too low for the boats and the gallows for boats would be supported on iron frames, not on wood as shown. The rigging, too, is far from blameless, while sidelights of that period were usually in lighthouses at the break of the fo'c'sle.

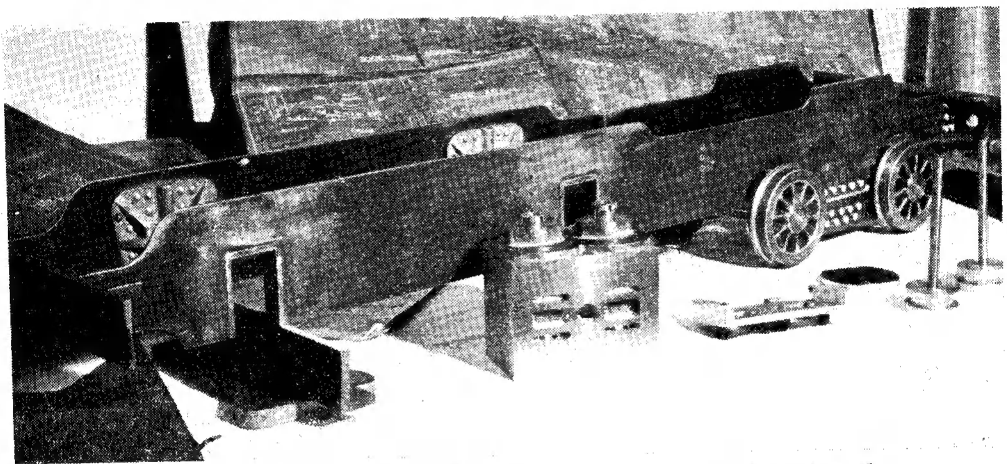


These are some of the more prominent errors to be noted on what is otherwise a fine piece of work, and it would be interesting to know just how they got there.

*A Locomotive Chassis in Ten Days

by G. F. Tonnstein

THE rate of progress ran so high on Monday, that in order to keep up with it, extra members were drafted in to turn out the studs and the nuts for the cylinder block. Yes, even these were turned out on the stand. Attention was turned to the boiler and all the end plates were cut to size and flanged by Mr. Wells. Whilst the heat was available the crankshaft was completed and several small jobs requiring brazing or heat treatment were attended to. A start was made on the connecting-rods and on the assembly of the main frames, the eccentrics were finished off and the chimney made. The Photograph No. 6 shows the assembly of the main frames by Monday morning (note the outline of the frames and remember my remarks re the first day).



Photograph No. 6. The assembly of frames commenced on August 22nd

Saturday:

1. *Cylinder Block Ports*—milled.
2. *Eccentrics*—commenced.
3. *Reverse Lever*—completed.
4. *Main Frame Stretchers*—milled.
5. *Bogie and Boiler Feed Pump*—completed and assembled.
6. All parts of *Crankshaft*—completed.
7. *Tender Frames and Axle Boxes, etc.*—commenced.

Man-hours worked—50.

Monday:

1. *Studs and Nuts* for Cylinder Block made, block also drilled.
2. *Eccentrics*—completed.
3. *Chimney*—completed.
4. *Crankshaft*—completed.
5. *Boiler End Plates*—flanged.
6. *Connecting Rods*—commenced.
7. *Tender*—continued.
8. *Assembly of Main Frames*—commenced.

Man-hours worked—62.

Tuesday, Wednesday and Thursday

Tuesday was one of the best days and the amount of work completed at its close rendered the progress board almost useless, and called for a complete rearrangement of the method of showing progress to the general public. Happily the assembly stage was now in full swing and the very sight of completed parts was enough to interest and to even excite people without any notices of work done, henceforth: "To-day's Programme" only was shown.

The completion of all parts for the tender, the connecting-rods (Photograph No. 7 shows Cyril reaming out these on the Progress No. 1 drill), all axleboxes and the commencement of the Joy valve-gear links, slide shaft, buffers, the many bushes, the cutting of boiler tubes to length, and the continued assembly of the main frames, together with the start of the assembly of the cylinders, give an idea of the hive of activity on the Malden Society's stand.

Excellent Castings

The beautiful finish of the cylinder block and associated parts is clearly shown in Photograph No. 8 and gives credit to Dick Marshall, who took on this important job right from the start. I should not forget Bert Jenner who did the milling, nor, of course, Kennion Bros. who supplied the castings. Whilst on castings, I should mention that all these proved to be of

*Continued from page 659, "M.E.," May 11, 1950.

Photo by] *[G. F. Tonnstein*
Photograph No. 7. Reaming connecting-rods on the Progress No. 1. drilling machine

excellent quality and free from blowholes, in fact, of all the dozens given us by Kennion Bros. for this job, only one was imperfect—this was changed at once. I for one was pleased that at least one defect was found, small though it was—it showed the castings had not been specially made or picked out for this job. A few castings came from Dick Simmonds, who were on the next stand to the Malden Society, and these were also of excellent quality.

The help given by the two Alford lads on the valve-gear links was very valuable, when on Wednesday, the rest of these were all but completed. Mr. R. J. P. Mew, who has built several locomotives, and at least one with Joy valve-gear, was in his element with this side of the production. Generally, this day was spent in finishing all the jobs put in hand on the Tuesday, but in spite of the speed made, some doubts were now being expressed as to whether the chassis could be completed by the Saturday. An enormous amount had been done but there still remained a lot to do before the job of assembly was advanced enough to say that " the backbone of the job was broken." Coupled to this was the fact that the parts were being made by a variety of members, and in order to keep up production, very little was being sub-assembled or fitted, hence a large collection of bits was piling up with an imaginary question mark over them, " Will they all go together ? "

Testing

The first real test was on Thursday when the driving wheels, axle and crankshaft, axleboxes and connecting-rods were fitted ; well, my Photograph No. 9 shows this lot together for the first time—everything was perfect—so far, so good. The valve-gear links were fitted with their bushes ; incidently most of these were made, amongst many other parts, by Mr. G. C. Smith, who recently took over the secretaryship of the Malden Society from " yours faithfully." All other parts of the valve-gear were put in hand, together with the coupling-rods. The progress on the cylinder block can be seen from Photograph No. 10 whilst the buffers for the job were completed, and several parts of the assembled chassis painted.

Tuesday :

1. *Assembly of Cylinders* etc.—commenced.
2. *Joy Valve-gear Links*—commenced.
3. *Valve-gear Slide Shaft*, etc.—commenced.
4. *Axleboxes*—completed and fitted with *springing* to main frames.
5. *Boiler Tubes*—cut to length and prepared for fitting.
6. *Bushes* for valve-gear, connecting rods, etc. turned.
7. Start made on *Buffers*
8. All parts of *Tender* completed.
9. *Connecting-rods*—completed.

Man-hours worked—60.

Wednesday

1. *Assembly of Cylinders,* etc.—continued.
2. *Valve-gear Links*—continued.
3. *Valve-gear Slide-shaft*—continued.

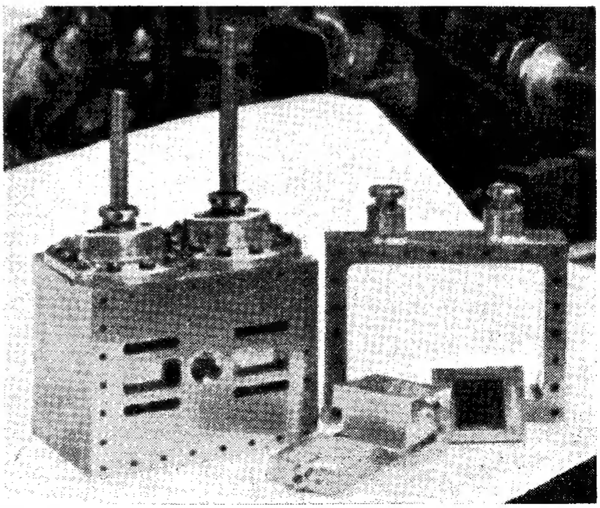


Photo by] *[G. F. Tonnstein*
Photograph No. 8. The cylinder block, chest, etc., on Tuesday, August 23rd

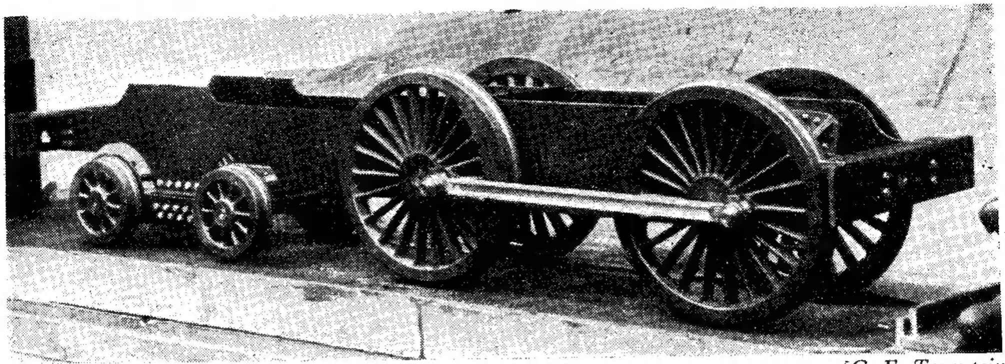


Photo by] [*G. F. Tonnstein*

Photograph No. 9. The main frames on Thursday, August 25th

4. *General Assembly of Main Frames*—continued.
5. *Boiler Barrel*—cut to length.
6. *Bushes*—continued.
7. *Buffers*—continued.
8. *Bushes*—fitted to connecting-rods, etc.

Man-hours worked—50.

Thursday :

1. *Assembly of Cylinders*, etc.
2. *Valve-gear Links*, etc.—continued.
3. *Slide Shaft*— completed.
4. *Driving Wheels, Bogie, Connecting-rods*, etc.—fitted to chassis—some parts painted.
5. *Coupling-rods*—milled, etc.
6. *Buffers*—completed.

Man-hours worked—40.

Friday and Saturday

The last *full* working day arrived, everyone was tense, and although inclined to irritation, were very mindful of the fact that this day was the critical one. Never before has a clock seemed to go as slowly as did the main one in the hall before the hour of 11.0 was reached—and "by gum" did time fly thereafter, before one could appreciate it, 9.0 p.m. was reached and the days' work was surveyed.

The cylinder block, all completed, was mounted in the chassis, the coupling-rods had been finished and buffers mounted.

The great task at this stage was the valve gear, and one where difficulties could easily arise. Five or six different members had been making the parts over the previous few days and were all of different engineering skill. Mr. Mew, however, kept an eye on things and those links put together on the Friday all seemed correct. Everyone was confident now that barring a serious breakdown or fault the chassis would be completed the next day.

After waiting minutes which seemed like hours, 11.0 a.m. approached on the last day. One member, fully exasperated by the seemingly long wait switched on his machine and operated the controls—a fatal mistake, a passer-by poked his head in the entrance and said with meaning, "It's not eleven o'clock yet." Thank goodness there was no "blunt instrument" laying close at hand or I'm sure there would have been a body to dispose of. Another minute, and the last of the 500 odd parts were being made.

I have mentioned the perspiration on the first day—but it fell well short of that on the last—the perspiration was not so much from hard work as from the traditional "top line." All the links, the motion-plate, slide-shaft, coupling-rods, etc. were fitted. The many shafts and pins and other odds and ends were made as the task progressed.

By 3.30 p.m. all was ready for the first test run. Mr. Bontor switched on the compressor he had

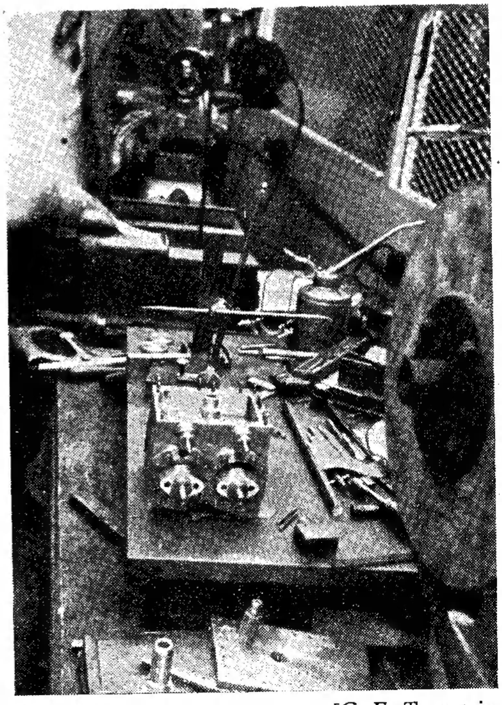
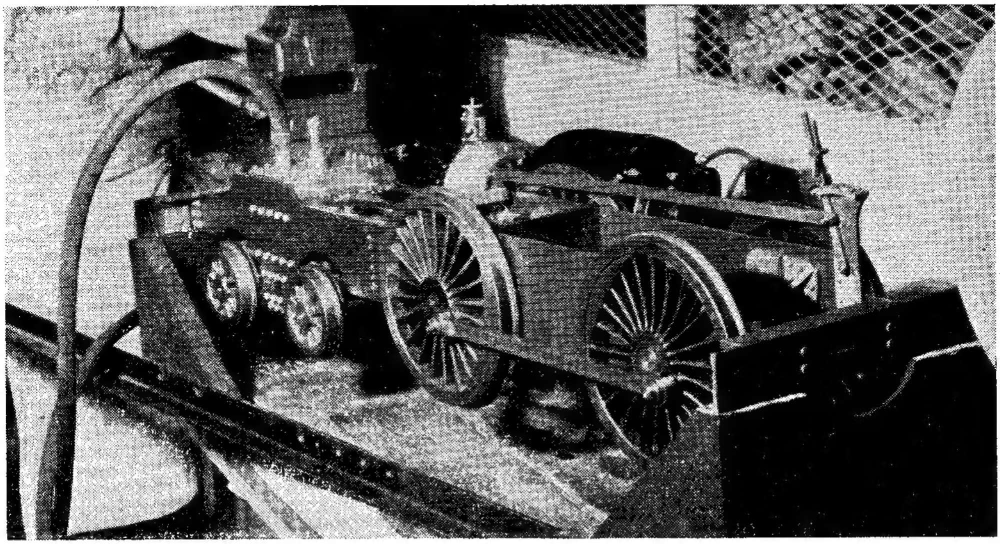


Photo by] [*G. F. Tonnstein*

Photograph No. 10. The cylinder block on Thursday. (Note covers in foreground and compare with photograph No. 8)



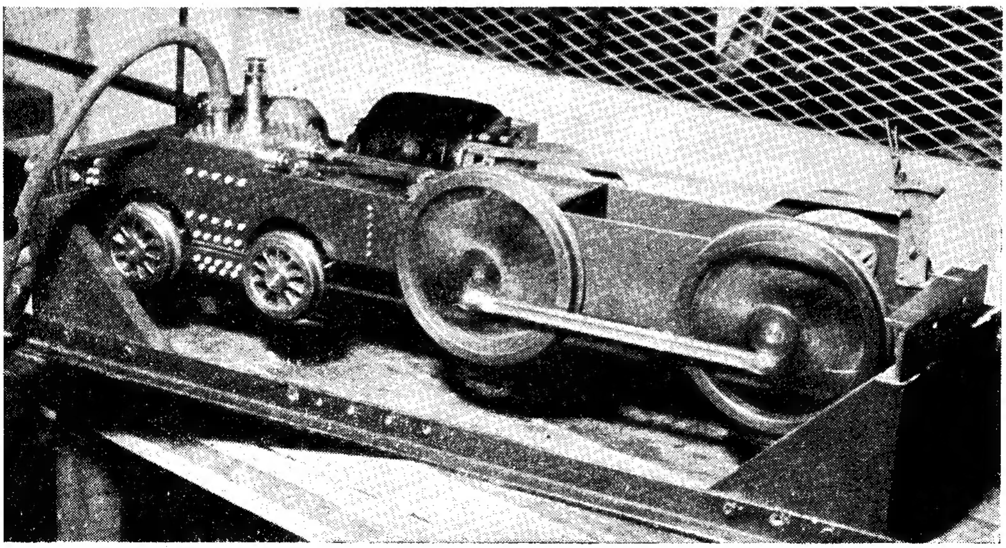
Photograph No. 11. Fully assembled and ready for test on Saturday, August 27th

brought along, and the sudden change in everyone's expression from that of expectancy, and even doubt to that which only triumph can produce told its own tale.

A few minutes later Mr. J. N. Maskelyne was there to give it the once over. Photograph No. 11 shows the completed chassis on its stand ready for a demonstration run soon after completion, (part of one member can be seen taking a well-earned rest against the Halifax lathe).

Until 5.45 p.m. the chassis was left running on the stand, as shown in Photograph No. 12, under the care of a few members drafted in for the job whilst the "working party" strolled round the exhibition hall to see what else there was, and to prepare for the demonstration in the Grand Arena at 6.0 p.m.

The final episode of this effort was just after 6.0 p.m. when the chassis was being shown running on compressed air in the centre of the Grand Arena. Mr. J. N. Maskelyne, representing the Exhibition Organisers, presented the



Photograph No. 12. The triumph of ten days "hard labour"

Photo by] [*E. T. Westbury*
Photograph No. 13. *Presentation in Grand Arena of scroll, marking successful completion of job*

Malden Society with a Scroll to commemorate their efforts during the exhibition. Photograph No. 13 was taken just after this presentation had been made and shows with Mr. J. N. Maskelyne (right) Mr. R. C. Marshall, Mr. B. R. Jenner (with special pipe for occasion) and myself holding the Scroll, the final Photograph No. 14 is of the Scroll itself, and tells its own story.

It should be remembered that many members mentioned or to be mentioned in this article worked only a few hours here and there (mainly in the evenings), whilst others took part or all of their annual leave for this effort. Whether it was for one hour, one day or a week, due credit must be given to this gallant band of helpers which included, Messrs. H. Barnes, I. G. O. Brown, C. H. Elkington, J. Hawker, R. E. Malins, R. C. Meredith, L. Moore, A. Wilton, E. Widowson, and the chief tea-boy M. Hack, as well as many others, and, of course, *all* those already mentioned.

Friday:

1. *Assembly of Cylinders*—completed.
2. *Valve-gear Links*—completed, *Bushes* being fitted.
3. *Coupling-rod*—completed.
4. *Buffers*—fitted.
5. *Cylinder Block*—fitted to chassis. Some more parts painted.

Man-hours worked—43.

Saturday:

1. *Valve-gear Links*—all completed.
2. *Odd Pins, Bushes*, etc.—made for job as required.
3. *Links, Slide-shaft, Motion-plate, Coupling-rods*, etc.—all fitted.
4. *Final Check Up.*

Man-hours worked—24.

5. Chassis *Tested* at 3.30 p.m.
6. Shown running on Stand, 3.30 p.m. to 5.45 p.m. and from 6.45 p.m. to 9.0 p.m.
7. Demonstrated in Grand Arena at 6.0 p.m.

Total man-hours worked—440 approximately.

Number of parts made—500 approximately.

Conclusion

The building of this locomotive chassis was not a stunt—it was a carefully planned attempt to show the general public (and model engineers) how a locomotive such as could be seen on the competition stands and running under steam on the S.M.E.E. track nearby was built. Whilst there was a target (to endeavour to build the chassis) the main point behind the scheme was a purely practical demonstration of model work.

The comments of spectators showed that *the majority had no idea* how the models they saw were built. Many model engineers expressed appreciation of wrinkles picked up and of advice given.

Finally, Malden members soon learnt to "love" one sentence: "Are you up to schedule?"

[This account of a good job well done will, we hope, be taken to heart by any club secretary who is becoming anxious as to the progress of his "club model."—Ed. "M.E."]

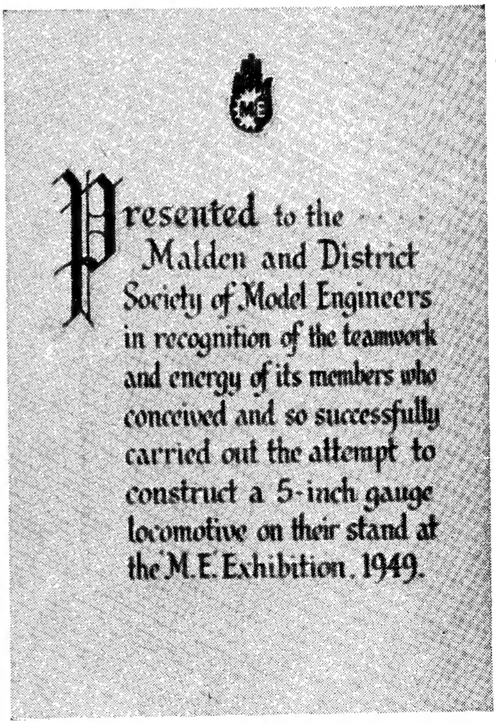
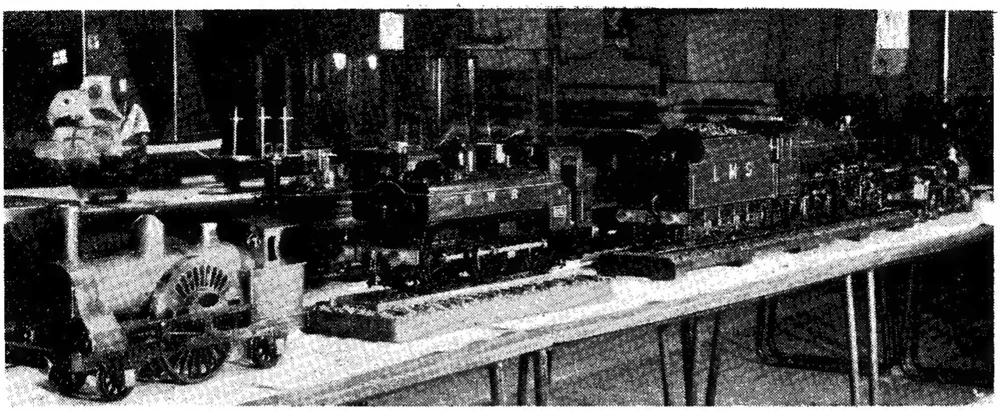


Photo by] [*G. F. Tonnstein*
Photograph No. 14. *Close-up of scroll*



General view of the model locomotive classes

The Kodak S.E.E.C. Exhibition

by G. G. Corder

QUALITY and not quantity was the keynote of this year's exhibition, combined with a marked increase in the support for the handicraft classes. The panel of judges, under Mr. J. N. Maskelyne, was satisfied with the standard of workmanship, and the awards made were well merited by the general appearance of the successful entries as well as the finer technical points.

The ever-popular locomotive classes contained many new finished models and some promising work in chassis form ; the marine section had the old, the modern and the original represented with examples of Mr. Karran's beautiful work, a Vosper 60 ft. launch from a member of the Ickenham and District Society and Mr. Meyer's rigged canoe—all notable entries in their particular field.

The high spots of the " ladies " classes—although mere males are not excluded—were some very high-grade work in the knitting, crochet and embroidery departments. It is perhaps a sobering thought to the expert modeller in his workshop, equipped with a range of power-driven tools, that a beautiful and shapely garment can be fashioned by twiddling a few balls of wool with a couple of pointed sticks !

Men did not have it their own way in the wood-carving class either, many beautiful examples of patient hand carving being the work of lady members of Mr. Louth's instructional class. The maestro himself was demonstrating the art at a side bench, supported by Instructor Rockall who was busy showing how easy attractive leather working could be. His pupils were the principal entrants in this class and many excellent examples were to be seen.

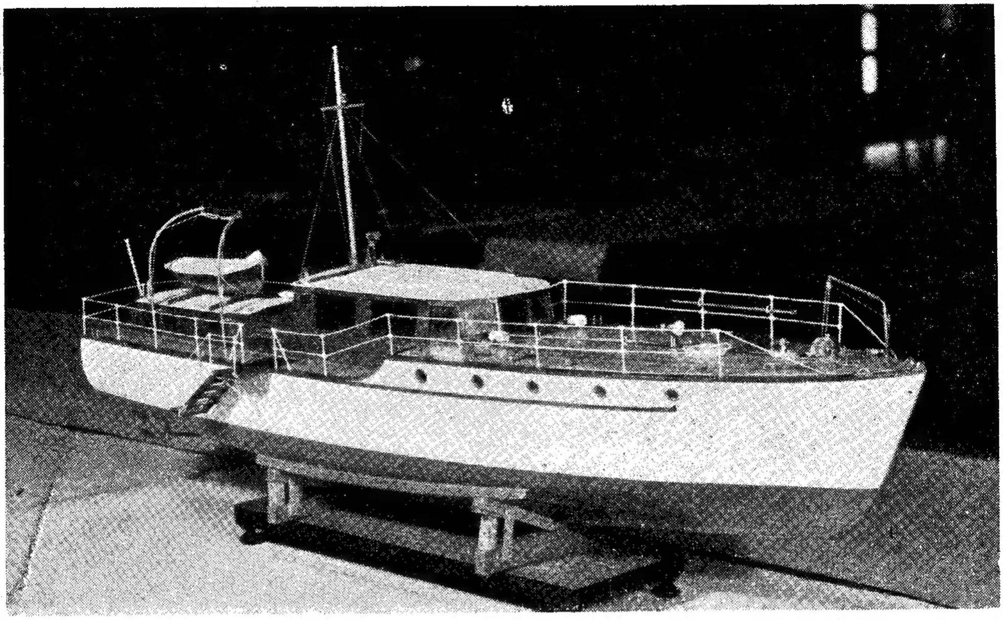
There is, however, something very masculine about the workmanship in George Malin's entry in the joinery class, where he submitted a ladies needlework cabinet (console model), furnished with hinged holders and drawers, for scissors and knitting needles, the various pairs of scissors also being the work of this versatile craftsman. His entry was an obvious choice for the " Amor " Cup award—a well-deserved win.

Apart from the competition classes, a number of other items of interest were displayed.

The camera division staged a fine " shop window " of cameras and equipment being mass-produced for export. Harrow Marionette Theatre showed some of their puppets, the Harrow Model Railway Society had their entire rolling stock and locomotives on view and Messrs. Electronic Developments Ltd., showed what could be done to control model boats and aircraft by radio.

The Harrow and Wembley Society (marine section) presented a complete club display of power boats and the full-size tug-mast and accessories which is always a feature of their exhibitions. They also kindly loaned the animated sign which was operating over the entrance to the hall.

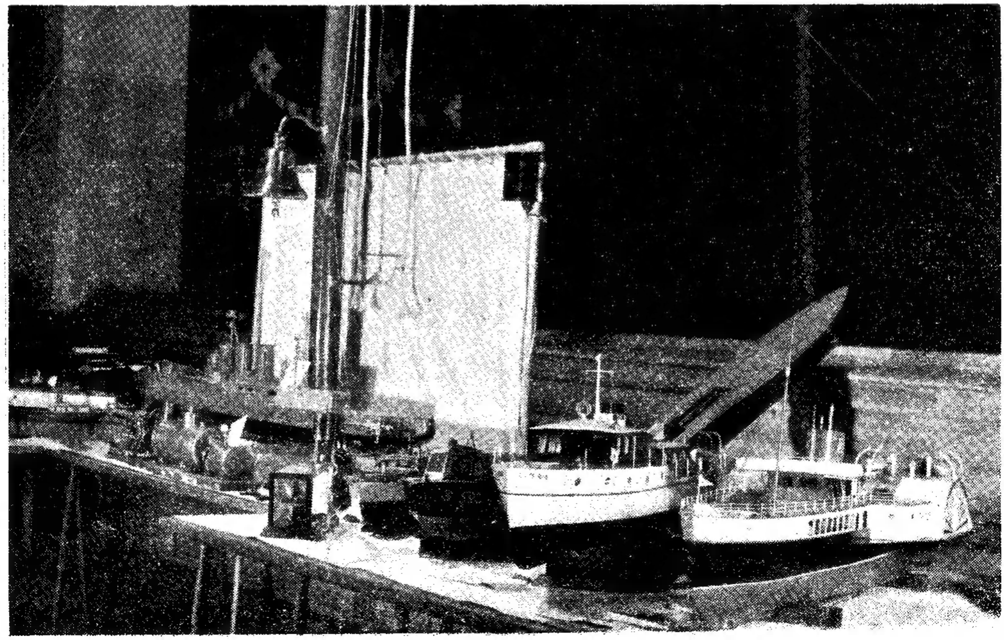
Messrs. Bassett-Lowke Ltd. presented a compact display of their famous range of parts for modellers and the Kodak society showed a range of members' work and operated a number of running models. Outside, in the car park, the club's rolling stock was operating on the club track with Mr. Pole and a number of helpers driving steam locomotives hauling many a load of excited children. The gramophone section of the K.R.S. dispensed music and the catering



A model Vosper 60 ft. standard motor yacht by Mr. A. S. Albert (Ickenham and District M.E.S.)

department provided teas and refreshments.

The avowed object of the society is to provide facilities for the development and encouragement of all forms of craftsmanship and to foster a respect for high-grade workmanship for its own sake. In this it is greatly assisted by the interest and assistance of management. The exhibition was made possible by the help and co-operation of society members and the support of local societies with the same interests.



General view of the Harrow and Wembley society's marine stand

The North London S.M.E. Regatta

THE North London S.M.E. made a fine effort on Sunday, April 23rd, by staging their first full-scale regatta. This event, held by courtesy of the Victoria M.S.C., at Victoria Park, London, was the first M.P.B.A. regatta of the year. The attendance was good, especially considering the fact that the chosen date was fairly early in the new season. The steering competition was marked by quite a sensational tie—both boats scoring three bulls and while no terrific speeds were recorded in the speed events, some interesting boats, both old and new, were seen in action.

The regatta opened with a *Nomination Race* for the straight boats and about 20 craft took their turn down the lake, a distance of 80 yds. The winner was J. Smith, of the Victoria Club with a new steam launch *Bulwar*; his error was 2.5 sec. in an estimated time of 45 sec. Some of the other boats were reluctant to steer a straight course and thus lost a lot of time. In most cases this ruined their chances.

Second and third on the programme were the speed events for *Class " C "* and *" C " Restricted* respectively. In the latter A. W. Stone (S. London) had a walk-over, but not before a display of aerobatics on the first run. On his second attempt 45 m.p.h. was reached for the five laps, the boat *Toots* speeding up after the timed laps were completed.

The " C " class boats did not fare so well. J. Benson's *Moth* petered out on both attempts and A. Weaver (N. London) now running *Wizard of Oz* on a surface propeller for the first time, recorded a slower speed than before alterations took place; however, it was good enough to win the race, no other boats recording a time.

A *" D " Class race* for 5 c.c. boats provided two entries—one from N. London and one from Enfield. The speed of both boats was rather low but both finished the course.

A short lunch interval intervened after which the regatta was continued with the *Steering Competition*.

The same boats that were seen in the Nomination race took part and the owners had evidently got to work on the steering gear, since most of the boats put up a good show. Mr. Newcombe (Victoria) scored 13 points and Messrs. Vanner, and Mitchell (Victoria) also had good scores. The last two competitors to run were J. Benson and A. Rayman, both of the Blackheath Club, and they both scored maximums! On the re-run J. Benson with *Comet* and A. Rayman with *Yvonne* scored an inner and a bull respectively, thus A. Rayman took first place.

The next speed event on the programme was the 500 *yd. Class " B " Race.* In this race all the boats had either alterations made since last year or were new to racing. One of the latter was *Spartan*, by N. Hodges (Orpington), which shows promise. G. Lines (Orpington) with the Class " B " record holder *Sparky II*, increased in length, recorded about 40 m.p.h. F. Jutton (Guildford) had made alterations to *Vesta II* and also recorded a lower speed than last season. On second runs, neither of these boats completed, so the first runs were the deciding factor.

The last event of the day was the 500 *yd. Class " A " Race.* A new boat *Gordon IV*, by E. Clark (Victoria) was an easy winner in this race with a speed of 44.4 m.p.h. It was interesting to see J. Innocent (Victoria) competing in this race with *Betty* the pre-war record holder. *Betty* started well enough but failed to finish the course on either attempt.

RESULTS

Nomination Race. 80 yds.

1. J. Smith (Victoria) ... *Bulwar* error 6.15 per cent
2. — Tankard (N. London) NL10 „ 6.5 per cent.

Steering Competition

1. A. Rayman (Blackheath) *Yvonne* ... ... 15 pts. + 5
2. J. Benson (Blackheath) *Comet* ... ... 15 pts. + 3

300 yd. " D " Class Race

1. Poyser (N. London) ... *Dolphin II* ... 39.4 sec. 16 m.p.h.

500 yd. " C " Class Restricted Race

1. A. Stone (S. London) ... *Toots* ... 22.66 sec. 45 m.p.h

500 yd. " C " Class Race

1. A. Weaver (N. London) *Wizard of Oz* 39 sec. 26.2 m.p.h.

500 yd. " B " Class Race

1. G. Lines (Orpington) ... *Sparky II* ... 25 sec. 40.9 m.p.h.
2. F. Jutton (Guildford) ... *Vesta II* ...26.5 sec. 39.5 m.p.h

500 yd. " A " Class Race

1. E. Clark (Victoria) ... *Gordon IV* 23.1 sec. 44.4 m.p.h.
2. N. Fort (Victoria) ... *Zipp* ... 44.4 sec. 23.2 m.p.h.

Bournville Model Yacht and Power Boat Club

As indicated on the M.P.B.A. fixture list, the above club's annual power boat regatta held under the auspices of the M.P.B.A., will take place on Whit Monday this year, May 29th.

The events are :—

500 yd. race for 30-c.c. hydroplanes for the " Coronation Speed Trophy."

500 yd. race for 15-c.c. hydroplanes for the " D. W. Collier Trophy."

500 yd. race for 10-c.c. hydroplanes.

500 yd. race for " C " class.

Steering contest for the " A. Hackett Steering Trophy."

Racing will commence at 1 p.m. and from time to time a change will be made from one class to another, including steering.

IN THE WORKSHOP

by "Duplex"

63—*Compressed Air Supply for the Workshop

IN the previous article, suitable apparatus for ■ low-pressure air supply was considered, and it is now proposed to describe an example of high-pressure equipment which, in one form or another, has been in use in our workshop over a number of years.

The portable compressor unit was originally constructed for inflating tyres, and for a period of eight years it regularly served two cars in this respect without faltering.

The drive consisted of ■ magneto sprocket fitted to the shaft of ■ ¼ h.p. motor, a length of cycle chain, and a large cycle chain-wheel attached to the crankshaft of the compressor.

This arrangement gave a drive ratio of ■ : 6, and the output of compressed air, which was taken directly to the tyres, was sufficient to inflate them quickly; in fact, with the compressor kept running, it was found that one tyre could be fully inflated while the pressure of the next was being tested. The time occupied, therefore, in blowing up all five tyres amounted to little more than that needed for testing the pressures.

Owing to the fact that the machine was kept running for short periods only, the compressor itself proved fully efficient for its intended purpose of inflating tyres; but, for more continuous work and for pumping at higher pressures, the lubrication system required some modification, as will be described later.

To obtain ■ greater volume of compressed air at constant pressure, as, for example, is essential when spray painting, somewhat more elaborate equipment is required, but the apparatus need be neither complicated nor costly, for the various components can usually be bought ■ surplus war-time equipment.

*Continued from page 630 "M.E." May 4, 1950

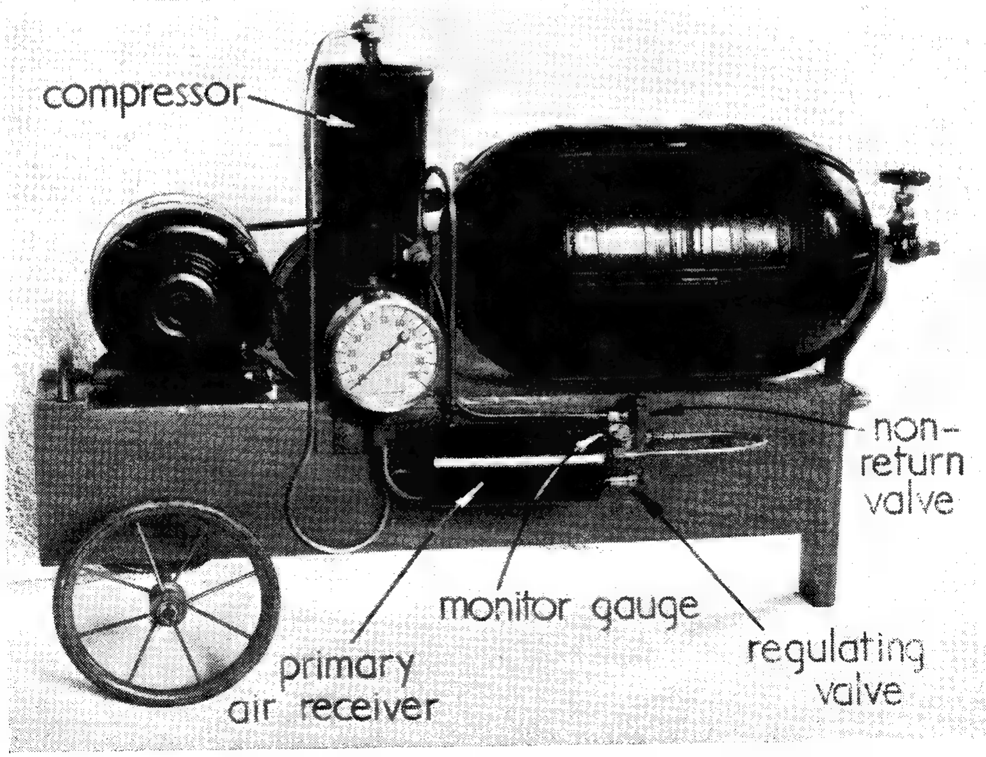


Fig. 1. The compressor unit—control side

In constructing a simple compressor unit the following items will be needed :—

(1) A compressor, capable of delivering air at pressures up to 100 p.s.i., that, with or without modification, will withstand continuous running.

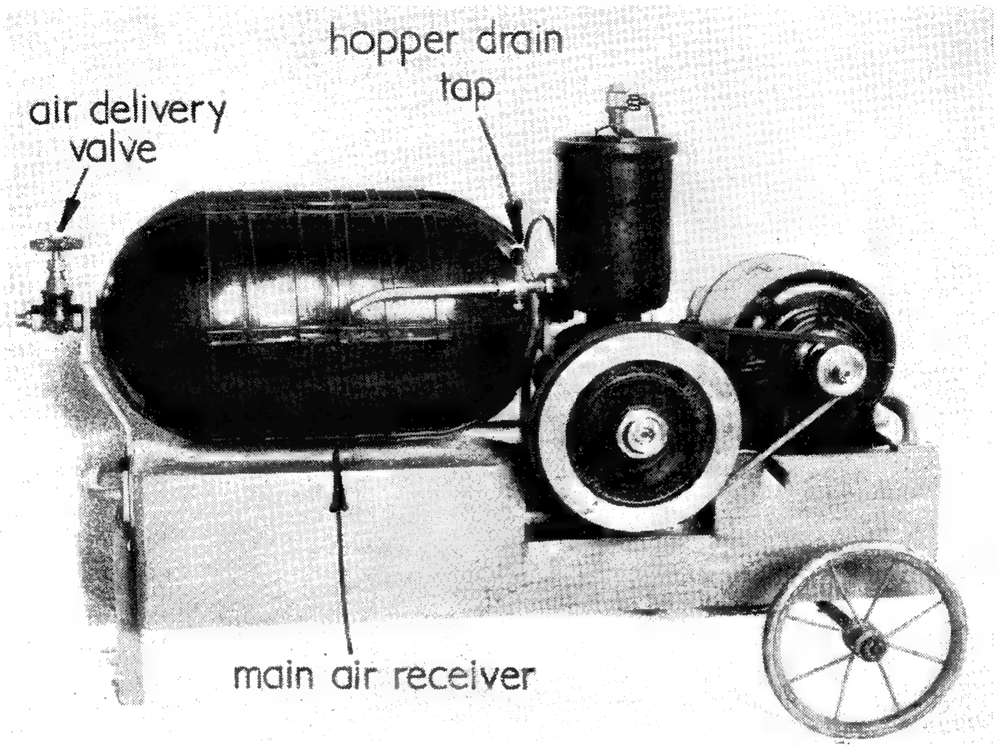


Fig. 2. The compressor unit—driving side

(2) A main air receiver fitted with a pressure gauge reading to 100 p.s.i. For safety's sake the receiver should have a pressure rating twice that of the compressor.

(3) A primary air receiver. Its purpose is to house the regulating-valve, which performs the double duty of adjusting the pressure of the air supplied, and acting as an unloading valve when starting the compressor against the load of a partly-filled main air receiver.

(4) A non-return valve, to be connected between the primary and main receivers.

(5) Copper connecting pipes and a rubber air-hose for attachment to paint guns or other apparatus.

If work can, in every case, be brought to the compressor, the machine may be made a permanent fixture in some convenient place.

After the compressor had ceased to be used for tyre inflation in the garage, it became a fixture in the workshop and remained so for a number of years. Recently, however, the machine has again been made portable, as it was often found impracticable to bring the work to the compressor.

The advantages of portability are almost too obvious to need stressing, and it is only necessary to mention spray-painting for the need of a mobile unit to be apparent. Those workers who prefer to retouch the paintwork of their cars will at once realise the convenience of portability, for it is seldom possible, or even desirable, to bring work of this kind into the workshop.

The Portable Compressor Unit

As will be seen in the illustrations, Figs. 1 and 2, the necessary apparatus is mounted on a small twin-wheeled barrow made from a piece of oak 6 in. square and 30 in. in length. This forms a base block for the equipment, and it is recessed on one side to receive the compressor mounting, whilst lifting handles are screwed to its upper surface. Originally, when the device was used only for inflating tyres, a long T-handle was fitted to the end of the base block so that the appliance could be readily wheeled about, but, in the garage, as a service pipe of sufficient length to reach all the car wheels was used, the long handle was discarded and, instead, an ordinary U-shaped door handle was attached to the base block to enable the machine to be moved from place to place. The latter form of handle remains, and it is now found that this

serves well for wheeling the new appliance when raised so that the weight is carried mainly on the two wheels. The wheels, it should be noted, have a wide track to afford greater stability when moving the machine from place to place.

The main components of the unit are mounted on the top of the base block, whilst the primary air receiver, the main pressure gauge and the non-return valve are all fixed at the side, as may be seen in the illustrations.

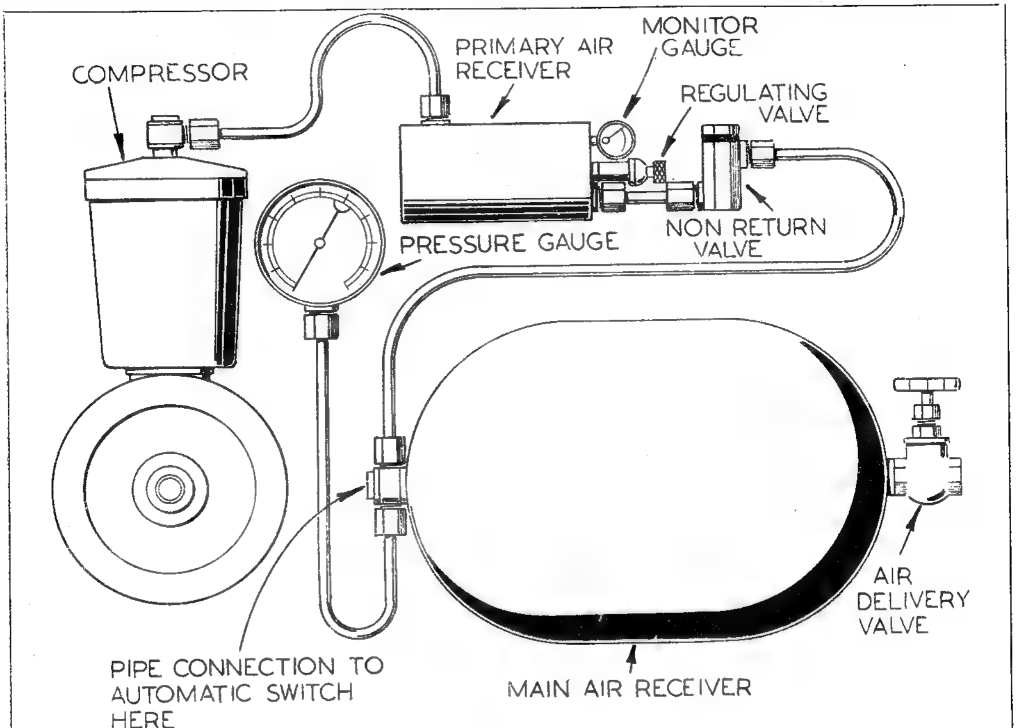


Fig. 3. Diagram of pipe connections

In Fig. 3 are shown, diagrammatically, the various pipe connections, and it will be observed that provision has been made for fitting an automatic combined cut-off switch and unloading-valve. The necessary connection for this appliance is already incorporated in the banjo union seen at the compressor end of the main air receiver.

When the compressor is but seldom used, the automatic switch is hardly necessary. However, if the machine is to be run often the addition of this device is fully justified, and full details of its construction will be given later after it has been thoroughly tested in service.

The Compressor

One of the surplus compressors that are advertised from time to time will be suitable for use with simple equipment, but it will be necessary to ensure that certain fundamental points receive attention when these machines are being adapted. These are :—

(a) The lubrication of the compressor ;
(b) The cooling system ;
(c) The fitting of a flywheel of adequate weight.

(a) Lubrication of the Compressor

Provided that the compressor is run at a moderate speed, the lubrication arrangements can be of quite a simple character. The design of a particular compressor naturally has a bearing on these arrangements, and it is manifestly impossible to consider every method of lubrication in this article. However, and in order to give some guidance on this point, the system used on the compressor incorporated in the equipment under review will be described, together with such modifications as have been made to fit it for more continuous duty.

The compressor in question is of a type formerly fitted to American cars for inflating the tyres, and was only intended for intermittent running. However, the modifications have enabled the machine to be run, without attention, for at least an hour at a time, a period which is adequate for most purposes.

As will be seen from the illustration, Fig. 4, the machine has an overhung crankshaft running in whitemetal bearings which are lubricated by means of a wick drawing oil from a well cast in the crankcase. The big-end is fitted with a bush of bronze and graphite and is designed to be oil-less, though, in practice, a film of oil seems always to be present. It should, at this stage,

be mentioned that the crankcase cannot be totally enclosed, for the air admission-valve is located in the head of the piston itself. It is necessary, therefore, to keep the crankcase open and to ensure that the incoming air is free from oil mist, which would clearly have a harmful effect on the both air-hose and tyres. The lubrication arrangements of the cylinder wall and piston are simple, and even primitive, for the latter, at the bottom of its stroke, is merely allowed to come in contact with an oil-soaked felt pad fastened to a steel shim which is held in place by the base of the cylinder itself.

This very simple system is entirely satisfactory, and prolonged use of the compressor does not suggest that any modification of the arrangement is needed.

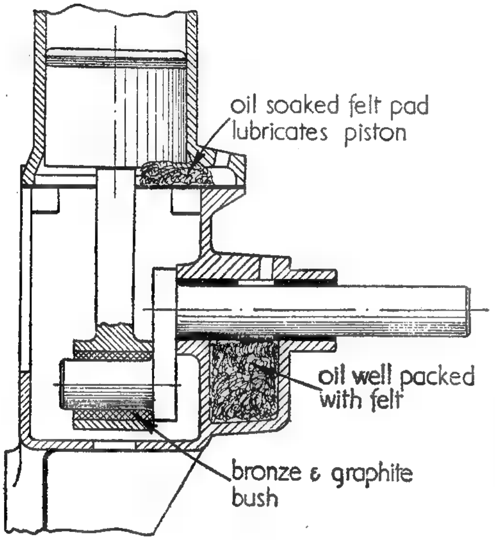


Fig. 4. Section of the compressor, showing the lubrication arrangements

Such alterations as have been made concern the main bearings. The whitemetal bearings, which were not a good fit in the first place, have been replaced by cast-iron bushes, and an oil cup of large capacity has been fitted to supply the cast-in oil well. The cup is provided with a wick syphon to regulate the oil flow.

(b) Cooling the Compressor

Originally, the compressor was air-cooled and, in this form, it functioned with complete satisfaction for many years. After it had been decided to increase the working speed, however, it was evident that the cooling system would have to be improved. Accordingly, the cylinder was fitted with a cast-iron hopper for water-cooling. As the method employed may have other applications, and so be of general interest, it will be described in some detail.

The illustration, Fig. 5, shows the arrangement in section, and it will be seen that all but one of the air-cooling fins have been machined away. The single, remaining fin, which has its upper surface turned square with the long axis of the cylinder barrel, provides an abutment for the cast-iron pot which serves as the cooling hopper. The particular component used was, originally, a lathe drip-can. These pots are often to be found amongst the scrap from a works millwright's shop, and it was from such a source, and through the good offices of the works manager that this hopper was obtained.

As will be seen from the illustration, the compressor has its delivery-valve set centrally in the head. This arrangement allows the air delivery pipe to be used as a stud for pulling the hopper against its abutment face by means of a bridge-piece fitted across the open top.

As a means of draining the water after use, the original tap and spout of the can have been retained.

Machining the Cylinder and Hopper

The cylinder was first bolted, by its base, to the lathe faceplate and set to run truly by means of a test indicator applied to the hole tapped in the cylinder-head, for it was correctly assumed that this aperture would have been bored and threaded concentrically with the cylinder bore at the time of manufacture. A tungsten carbide right-hand knife tool was then set in the slide-rest and the unwanted cooling fins removed by a turning operation, which was continued until the barrel of the cylinder presented a smooth appearance. The remaining fin was then faced, the machining being extended outwards to produce as large a turned surface as possible without unduly weakening the fin. With the completion of this operation, the machining of the cylinder was finished.

The hopper, when received, presented a very dirty and neglected appearance. It was therefore thoroughly cleaned and wire-brushed, and the accumulation of fine metal turnings, found in its interior, was scraped away.

As an initial machining operation, the base was gripped in the four-jaw independent chuck and set to run truly by eye, care being taken to see that the mouth of the pot was as nearly central as possible. When all had been adjusted satisfactorily, a Slocomb centre drill was run into the base extension which originally formed a mounting for the drip-can; in this way it was possible to support the work with the tailstock centre.

The rim of the hopper was then machined with a tungsten carbide knife-tool, taking very light cuts, until the facing presented a uniform appearance.

After removal from the chuck, the pot was mounted on the faceplate by its open end by being bolted in place with four clamps, applied to the shoulder of the rim seen in the illustrations. In order to obtain a firm hold, these clamping-pieces had their inner ends filed to match the curvature of the hopper.

After setting the work to run truly by eye, the base was faced and then bored to make the hopper an easy sliding fit on the previously machined cylinder barrel.

As will be seen in Fig. 5, the hopper seats on a rubber ring, which can be cut out from a piece of thick sheet rubber, or it may be found that a

rubber jointing ring, obtained from a preserved food container, will serve this purpose.

In passing, it should be noted that rubber rings from this source are well worth keeping, for they will be found useful in many ways. These rings are usually made of good quality rubber, and are

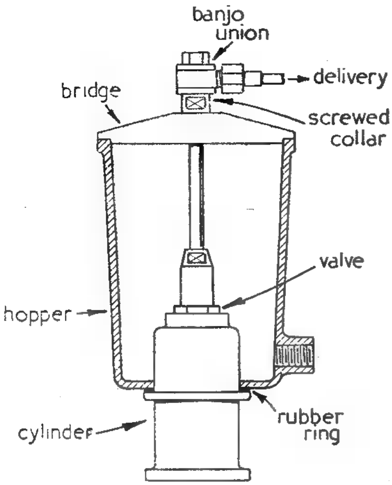


Fig. 5. Showing method of securing hopper

of a size that enables them to be used on just such work as has been described above.

(c) The Flywheel

One of the first essentials in a compressor intendedf or workshop use is that, to run smoothly, the machine should have a flywheel of adequate weight, as this lessens the shock to the mechanism at the higher working pressures employed. Most types of surplus compressors were designed for use with aircraft engines and other similar power units, and consequently they were built directly into.these engines, rendering a flywheel unnecessary. The particular compressor under consideration is an example of this mode of construction, for, when fitted to a car, it was driven from the engine through ■ dog-clutch which allowed engagement and disengagement at will.

The ⅝-in. diameter crankshaft is machined parallel and is fitted with a key, so that the mounting of a suitable flywheel is ■ simple matter. Fig. 6 shows the method employed, and it will be seen that the wheel seats on ■ tapered, split conical adapter which is drawn into the bore of the flywheel by a ring nut, this causing the adapter to grip the crankshaft firmly. To prevent any possibility of creep, ■ key, made a firm fit in the shaft, projects through the adapter into a keyway machined in the wheel.

Air Reservoirs

As the maximum working pressure of the system is 100 p.s.i., both reservoirs must be capable of withstanding ■ pressure of at least twice this amount. Oxygen bottles from aircraft make excellent main air receivers, as they are tested to 400 p.s.i. which allows an ample margin of safety. These cylinders are made from stainless-steel, and have threaded bosses at either end to take the necessary pipe connections.

The primary receiver may be made from a short length of 16-gauge brass or copper tubing fitted with ends that are brazed in position. If a tie-rod is fitted to pass through both end caps, and is screwed into one cap and nutted over the other, soft-solder may be substituted for brazing, but care must be taken to see that the tie-rod is also soldered.

Pressure Gauges

These should be of robust construction and, in the case of the main gauge, of sufficient size to enable it to be easily read. The monitor gauge, shown in the illustrations, is not essential, but it will be found convenient when adjusting the regulator valve on the primary air-receiver. The pattern of gauge commonly used on small locomotives is suitable for the present purpose.

If the main gauge is connected as shown in Fig. 3, the indicator hand will not flicker, for the pulsating pressures, which are unavoidable in ■ single-cylinder compressor, are completely damped out by the primary air-receiver and do not pass on to the main reservoir. However, if it is desired to connect the gauge in a line known

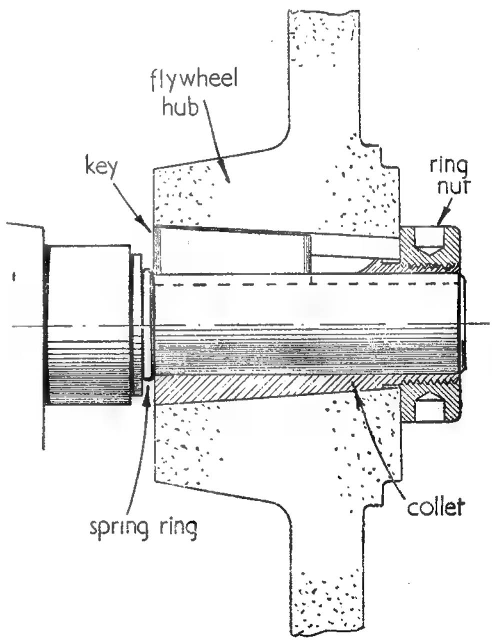


Fig. 6. The flywheel mounting

to have ■ pulsating pressure, damping must be effected by fitting the gauge with a union nipple having a very small bore, drilled with, say, a No. 80 drill. However, this form of nipple will require periodic examination to make sure that it has not become corroded and obstructed.

The Non-return Valve

The function of this component is to prevent loss of air from the main receiver when relieving the pressure in the compressor by means of the regulator-valve. Any well-made valve of either the ball or cone type will serve this purpose. The valve need not be spring-loaded, but, where a spring is fitted, the spring must be made of hard brass or phosphor-bronze wire, for steel springs in this situation soon rust and fail to work properly. A suitable design for a non-return valve is shown in Fig. 7.

Air Hose

The rubber hose should be of as light weight as possible, but, at the same time, it must have adequate mechanical strength. When spray-painting, in particular, a heavy hose would make the work most irksome. The type of tubing sold

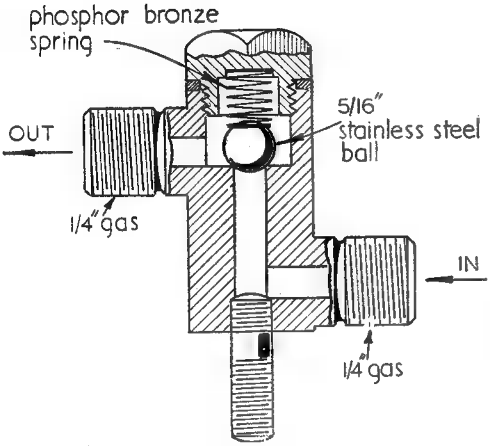


Fig. 7. The non-return valve

for tyre inflation purposes, although of light weight, is well able to withstand the wear and tear due to being dragged over the ground and, moreover, it will not easily kink. The bore of the hose should not be less than ¼ in. otherwise the supply of air to the apparatus in use may be restricted. All unions should be well secured and provision must be made for a quickly detachable hose connection to paint guns and similar equipment.

The air delivery-valve fitted to the main receiver must be of the screw-down type, for cone-seated taps such as are used on petrol tanks are apt to leak ; moreover, the latter are difficult to adjust exactly when pressure regulation of the air supply is required.

It has not been considered necessary to fit a tap or valve to either of the air receivers for drawing off condensed water, for experience with the equipment over a number of years has shown that, with relatively light duty, the amount of condensate formed is small. Moreover, any water collecting in the primary air receiver may be readily drawn off by opening the regulating-valve.

As has already been mentioned, the original drive from the ¼ h.p. motor was by means of a chain and sprockets, but, for the more continuous high-pressure working needed for spray painting and other workshop processes, a V-belt drive will give better results and will also require less attention. Moreover, with this form of drive, the drive ratio can be easily altered, as found necessary, to suit the working conditions.

When a V-belt is bent round a small pulley, power will be wasted if the belt does not flex easily ; for this reason, it is sometimes better to use two or more small belts rather than a single large belt. Furthermore, the diameter of the pulleys should be as large as possible, in order to increase both the belt speed and driving power and, at the same time, to reduce the bending stresses.

During a test of the machine, the 1/3 h.p. electric motor, running at 1,450 r.p.m., drove the compressor through a single ⅜-in. V-belt and with a drive reduction of 4 to 1. Under these conditions, a pressure of 100 p.s.i. was quickly raised and was maintained in the air reservoir for more than an hour with a spray-gun in use. In spite of the continuous running, it was found that the cooling water in the hopper became only warm. Nevertheless, to reduce belt slip and to prolong the life of the drive components, it was decided to fit three ⅜-in. belts running side by side. With this arrangement, owing to the greatly increased area of belt contact, there is no need to tighten the belts unduly to control slip ; this, in turn, lessens the load on the shaft bearings and reduces wear. The type of drive fitted is known as a V-flat drive ; that is to say, the belts run in a V-pulley attached to the motor shaft and thence directly on the flat face of the flywheel.

Maintenance

The maintenance of the machine amounts to little more than seeing that the compressor itself always has a proper supply of the correct lubricating oil. The oil used for this purpose should be a lubricant of medium body as sold for use in petrol engines. Apart from this, it is only necessary to make sure that the driving belts are correctly adjusted and that the apparatus as a whole is kept clean. The air-hose, when not in use, should be kept coiled and its connections maintained in a clean condition, free from oil and dirt. It is not our practice to store the air-hose on the compressor unit itself, but those who prefer to do so will find it convenient to coil the hose round a pair of cleat-hooks attached to the side of the base block. The same remarks apply to the motor connecting cable, which may conveniently be wound round the motor when the unit is not in use.

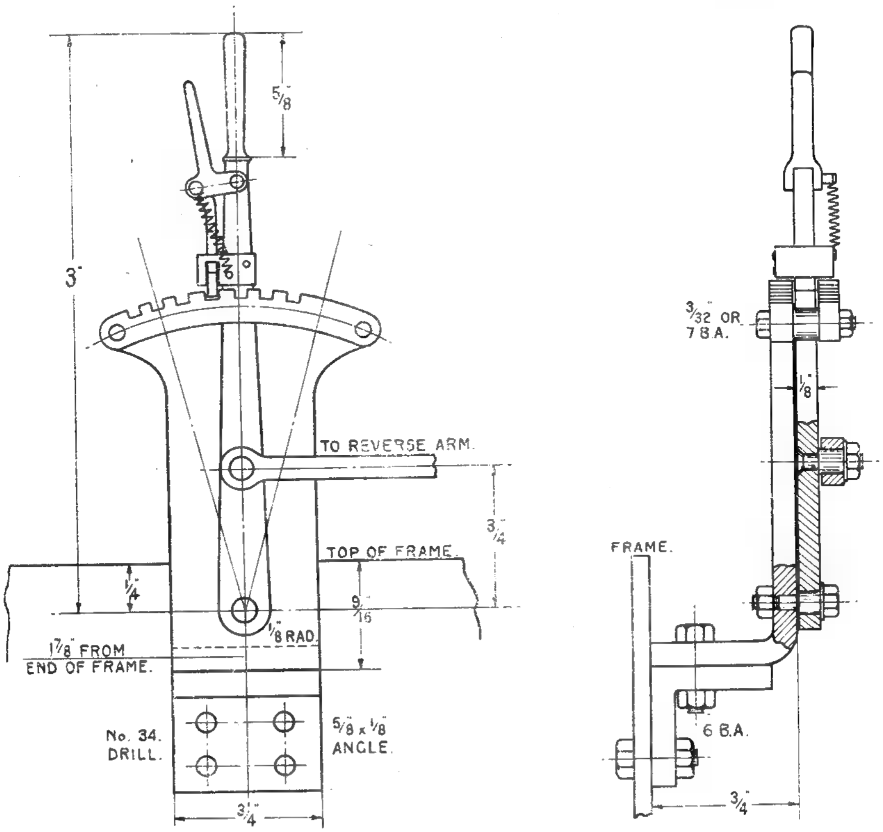
Finally, though it has not so far been found practicable to do so on this particular compressor, it is suggested that some form of air filter be fitted, especially when the equipment has to function in a dusty atmosphere. A filter on the air inlet will materially lengthen the life of the machine, but it must not be of a type that restricts the incoming air unduly or the performance of the apparatus will suffer. An air cleaner of the pattern fitted to some small commercial petrol engines may be found suitable for this purpose, but the mode of attachment will, of course, depend on the design of the compressor.

"L.B.S.C.'s" Beginners' Corner

Reversing Lever for "Tich"

THE Walschaerts gear on our weeny shunting pug is reversed and notched up by what enginemen call a "pole" lever, to distinguish it from the wheel-and-screw type. Among full-size fraternity, anything that operates the gear is called a "lever," and a driver speaks of "notching up" with a wheel and screw, although there are no actual notches, except some small ones in a little circular catch plate attached to the screw, between the wheel and the stand. A small catch engages with these, to prevent the wheel turning of its own accord (they will!) when the engine is running. Some screw reversers have a double-armed handle, like those on Stroudley regulators, instead of a wheel; and on these, one of the handles is pivoted, and actuates the catch. The Billinton passenger engines on the L.B. & S.C.R. had this type, and it is also found on many Great Western engines; but all goods and shunting engines have a "pole" lever, which is naturally much quicker in action than a screw, and therefore more suitable for shunting.

In the arrangement shown for *Tich*, which is typical of full-size locomotives of this type, the lever is carried by a stand, mounted on a bracket well clear of the boiler, which should be welcome to those with tender fingers. It is long enough to be easily get-at-able when running, gives easy control of the valve-gear, is simple to make, and "looks right." The reversing rod, or reach-rod, as it is frequently called because it enables the driver to "reach" the gear, goes straight from the reversing lever to the arm on the weighbar shaft, passing through the side tank. We shall make provision for that, when we come to it.



Details of the reversing lever

Stand and Sector Plate

I don't advise the use of a casting for the stand for a "pole" lever, as the latch would soon "make hay" of notches cut in soft metal. Make the stand from $\frac{1}{8}$-in. steel plate. A piece about 3 in. long and $1\frac{1}{2}$ in. wide, will be needed. Mark out on this, the outline shown in the detail drawing, and saw and file it to the given dimensions, all except the curve at the top. Leave that on the large side. Then from another piece of the same kind of steel, mark out the curved sector-plate, minus notches, and cut that out as well. I don't have to re-detail out simple jobs like those! Drill a No. 41 hole at each end of the sector-plate, then use it as a guide for drilling the corresponding holes in the stand. Temporarily clamp the two pieces together, and put the drill through the lot, taking care to file off any burring. Put a couple of temporary 3/32-in. or 7-B.A. screws and nuts in, then remove the cramp, and file the two pieces to the curve as shown. Finish off by draw-filing; that is, hold a fine file by its ends, and draw it lengthwise, backwards and forwards, a few times over the full length of the curve. This will give a very nice finish.

Catch the stand in the bench vice, upside down, with the narrow end just $\frac{7}{8}$ in. above the vice jaws, and bend to a right-angle. Don't hit the foot direct with a hammer, or you will mark it badly; hold a piece or iron or steel bar against it, and hit that. Also take it easy, or you will crack the steel at the bend. Soft ductile steel will bend without cracking. If the steel you are using, appears hard when sawing and filing, anneal it before bending, by heating to red, and letting it cool naturally. If any builder fancies his skill as "the village blacksmith," he could bend the angle whilst the metal was still red-hot. It merely requires a little dexterity. You want to be mighty quick at setting it in the vice and giving it the K.O. before the redness dies away; quicker than I can write these words. Red-hot steel bends very easily indeed, there is not the slightest risk of fracture, and the job comes out very neat, after the scaly surface has been cleaned up. Beginners might do worse than try their hands on a few odd bits of scrap steel; practice still makes perfect! After bending and cleaning up, trim the foot to size, and drill four No. 34 holes in it, as shown. If anybody makes a slight slip, and finds that the stand is a weeny bit high or low, don't worry, it won't matter; merely make sure that the hole for the fulcrum-pin is exactly $1\frac{11}{16}$ in. from the top of the curve. This hole can now be drilled No. 34, on the centre-line as shown in the illustration.

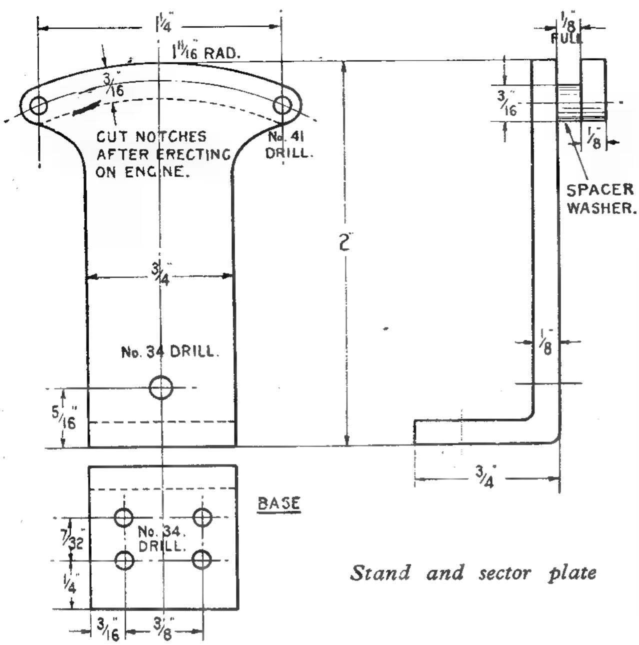
For the spacer washers, chuck a piece of $\frac{3}{16}$-in. round steel rod in the three-jaw. Face, centre, and drill down about $\frac{1}{2}$ in. with No. 41 drill. Part off two slices about 5/32 in. thick; then re-chuck each, and face off each side until they are a full $\frac{1}{8}$ in. thick, so that when the bolts are tight, the sector plate will just allow the lever to slide between it and the stand.

How to Mill a Lever from Solid

The lever itself can be made either from the solid, or built up, the latter being easier. For the solid job, a piece of $\frac{3}{16}$ in. by $\frac{1}{4}$ in. mild-steel would be needed, about $3\frac{1}{4}$ in. long. Chuck truly in four-jaw, and turn the handle part with a round-nose tool, setting the top slide over about a deg., if it has a graduated scale; if not, you'll just have to judge the taper. Lucky owners of a milling machine can then grip the embryo lever in the machine-vice on the miller table, and with a small slabbing cutter, not less than $\frac{3}{8}$ in. wide, they can mill off first one side of the lever, and then the other, leaving the metal just $\frac{1}{8}$ in. thick. On my own milling machine, which is a No. 4 Burke (exactly similar to a Brown & Sharpe, and a real hefty job) I never have to measure for thickness, as the screws all have finely graduated collars. In the above job, for example, I should set the piece of metal in the machine-vice with half its thickness projecting above the jaws. As the bottom of the machine-vice is dead true with the table, and I keep a boxful of pieces of parallel packing, all I have to do, is to insert enough packing under the metal, to bring it to required height, tighten the vice jaws, and pull the packing away. The metal is then held parallel with the table. If any follower of these notes can't do it that way, he can set the metal "by eye," tighten the vice just sufficiently to hold it, then set his scribing-block needle to one end. If the other doesn't tally, a tap or two with a hammer, judiciously applied up or down, as the case may be, will soon level it up. When the bent end of the scriber needle scrapes over each end, with the base resting on the miller table, it is O.K. Tighten the vice jaws, and you're literally "all set."

I set my cut as follows. With $\frac{3}{16}$ in. thickness of metal, we need 1/32 in. off each side to bring the lever to $\frac{1}{8}$ in. thickness. With the metal under the cutter, I raise the table, and pull the belt by hand backwards, until the teeth of the cutter just touch the metal. Then I run the metal out from under the cutter, and set the graduated collar on the raising and lowering spindle to zero. Next, I turn the handle until the 31 marking on the graduated collar lines up with the zero mark on the machine; that indicates that the table has been raised exactly 1/32 in., and the machine is started, the self-act put in, and in little more time that it takes to write this, the machine has taken 1/32 in. off the metal at the one traverse, and left a beautiful finish. For lubrication, a small can, with tap and $\frac{1}{8}$-in. pipe, is hung on the overhanging arm of the machine, and a mixture of "Cutmax" (diluted with paraffin for a big job, but used "neat" for small jobs) is allowed to drip on to the cutter as it "does its stuff." A repeat performance on the other side of the metal, brings the thickness correct.

To get the taper, all you do is to cover one side of the milled surface with the blue or violet marking-out fluid that I have described so often, and mark out on it, the taper of the lever. Then catch the lever in the machine-vice, with the marked surface at the side, and adjust it until the needle of the scribing-block touches the marked line at each end. Tighten jaws, start machine, set the lever into cut, and raise the table until the cutter bites down as far as the marked line. Then traverse the table, and the cutter will do the rest. The end of the lever is rounded off, same as described for coupling-rods and similar bosses.



Stand and sector plate

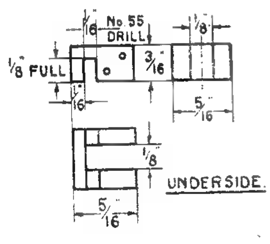
How to Make a Built-up Lever

The great majority who don't possess milling machines, can easily build up their levers as follows. The flat part needs a piece of $\frac{1}{8}$ in. by $\frac{1}{4}$ in. mild-steel, $2\frac{1}{2}$ in. long, and a short piece of $\frac{1}{8}$ in. round ditto for the handle. The flat piece of steel is filed up to the shape shown. The handle is turned up as described above, with the bit of round steel held in the three-jaw. Butt the handle and the flat part together on a piece of thick sheet asbestos; this is fairly soft, so that if you press the handle and blade down hard, they will sink slightly into the surface of the asbestos, and will not move when heated. Put a taste of wet flux on the joint, lay the lot in the brazing pan, heat to bright red, and touch it with a bit of brass wire, which will melt and flow in. Coarse-grade silver-solder may be used if desired, in which case a dull red will suffice. Let cool to black, quench in cold water, clean up, and you have a lever that will give a good service as one cut from solid.

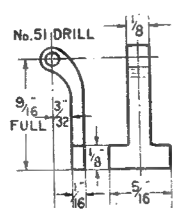
Locking-gear

Some arrangement of instantly locking the lever either in mid-gear, full-gear or the notch-up positions, is needed on any engine, big or little; and this is accomplished by the means shown. Beginners who are car owners will note at once that the locking-gear differs from that on their hand-brake lever, inasmuch as it locks the lever in both directions, and the trigger must be pressed against the handle, to move either way. The parts comprise a trigger, latch, and latch block. To make the trigger, get a piece of mild-steel (great stuff, this mild-steel!) about $\frac{3}{4}$ in. long, $\frac{3}{8}$ in. wide, and a full $\frac{3}{16}$ in. thick. Mark off on one side, the outline of the trigger, as shown in the small detail illustration. First, drill the two No. 53 holes clean through the block. Next, slot right across the drilled end to a depth of $\frac{1}{8}$ in. full, and $\frac{1}{8}$ in. wide, by the method already given for pump ram and the other slotted parts; then saw away the unwanted parts each side of the tongue, or finger grip, and finish off with a file. These little "twiddley-bits" seem to entail a lot of work, but they are quite easy if taken by stages, as above. They remind me of the kiddy who shied at spelling "Constantinople" as one word, but managed it easily enough by what my old granny of beloved memory, always called "silly-billies."

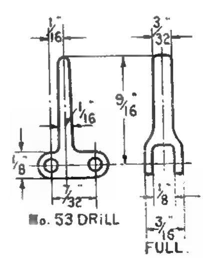
For the latch, you'll need a bit of mild-steel of $\frac{1}{4}$ in. by $\frac{5}{16}$ in. section, or nearest available, and $\frac{3}{4}$ in. long. The procedure is pretty much the same; mark off, drill the "bird's eye," saw away the unwanted metal, and file to outline. Alternatively, a piece of thinner metal could be used, and the eye end bent over. The latch-block is the simplest of the lot, being merely a little piece of $\frac{5}{16}$ in. square steel, $\frac{3}{16}$ in. thick. The easiest way to make this component is to take a piece of $\frac{5}{16}$ in. by $\frac{3}{16}$ in. mild-steel rod long enough to clamp under your lathe tool-holder. Square off the end, then slot it $\frac{1}{8}$ in. wide and $\frac{1}{4}$ in. deep, by method described for pump-ram. Then, at $\frac{3}{16}$ in. from the end, make a cross slot $\frac{1}{16}$ in. wide and a full $\frac{1}{8}$ in. deep. Saw or part



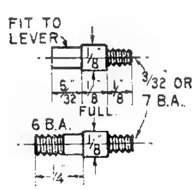
Latch block



Latch



Trigger



Pins or studs for lever

off $\frac{1}{16}$ in. behind the cross slot, and you have it.

How to Assemble and Erect the Lever

Drill a No. 30 hole squarely through the bottom end of the lever, and at $\frac{3}{4}$ in. above that, drill a No. 34 hole, countersinking it on one side. Next, turn up two little shouldered pins, as illustrated, from $\frac{1}{8}$-in. silver-steel rod held in three-jaw. Beginners should be able to turn pins with their eyes shut, by now! All you do is to use a knife-tool, a drop of cutting oil, and a little care. Turn down a full 5/32 in. of the rod, to a tight fit in the No. 34 hole in the lever. Part off at $\frac{1}{4}$ in. from the shoulder. Reverse in chuck, and turn down a bare $\frac{1}{8}$ in. of the other end, to a diameter of 3/32 in. Screw 3/32 in. or 7-B.A. For the fulcrum-pin, turn down $\frac{1}{4}$ in. of the rod to 7/64 in. diameter, and screw a full $\frac{1}{8}$ in. of it with 6-B.A. die; part off, turn and screw the other end exactly as described above. Squeeze the first-mentioned pin into the hole in the lever, as shown, hammering the end into the countersink, and filing off flush. The fulcrum-pin is put through the hole at the bottom end of the stand, and secured with a 6-B.A. nut.

Drill a No. 51 hole through the lever, a bare $\frac{1}{8}$ in. below the handle; smooth off any burring, then put the longer end of the slotted part of the trigger over it, and drive a piece of 16-gauge spoke wire, or $\frac{1}{16}$ in. silver-steel, through the lot, filing off flush each side. I believe that I mentioned a while ago, that cycle spokes from 16-gauge upwards, can be purchased cheaply by the dozen at any cycle and motor accessory stores; and the wire from which they are made, is excellent for small pins, as used in locomotive building. Several beginners have recently asked what I meant by spoke-wire, hence the reminder. Put the "bird's eye" in the other end of the trigger slot, and pin it likewise; but in this case, leave one end of the pin sticking out from the side of the trigger for about 3/32 in., as we need something to hang the spring on, when finishing off the lever, see illustration. Put the latchblock over the latch, with the cross slot over the wide part of the latch, as shown; but don't pin the block to the lever yet.

Now remove the sector-plate from the stand, and put the lever in position, with the hole in the bottom end over the fulcrum-pin, securing it with a commercial nut and washer. When the nut is tight, the lever should be just free to swing. Replace the sector-plate, and tighten the bolts. The latch should now be resting on top of the stand and sector-plate, the trigger almost touching the handle of the lever. Adjust the latch-block so that it just clears the top of the stand and sector-plate, as shown in the illustration of the complete bag of tricks, and fix it to the lever in that position with a couple of small rivets. For jobs like these, I use bits of domestic blanket-pins, drilling No. 57 holes through block and lever, countersinking them, driving the pins through, snipping off, hammering into the countersinks, and filing flush. If you like, the head end of one end of one of the pins may be left projecting a weeny bit, to take the lower end of the latch spring; it saves putting in a $\frac{1}{16}$-in. or 10-B.A. screw.

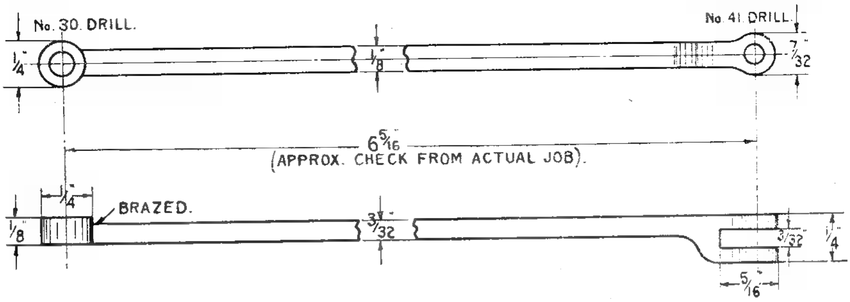
Now we need a bracket on which to mount the whole doings. This is easily made from a bit of $\frac{5}{8}$ in. by $\frac{1}{8}$ in. angle, steel or brass, doesn't matter which. Square off each end, to a length of $\frac{3}{4}$ in., and drill four No. 34 holes in it as shown. Clamp this temporarily to the right-hand frame of the engine, so that the centre of it is $1\frac{7}{8}$ in. from the back end of frame, and the top of it $\frac{9}{16}$ in. below the top of frame; a toolmaker's cramp will do the needful. Drill No. 34 holes through the frame, using those in the angle for a guide; file off any burrs, and secure with four 6-B.A. bolts. Set the stand carrying the lever on top of this bracket, in the position shown in the assembly drawing, that is, sides of bottom of stand to be flush with sides of bracket, and the edge of the foot of the stand touching the frame. Clamp temporarily in place, drill the bracket to correspond with the holes in the foot of stand, and fix with four 6-B.A. bolts and nuts. Note—although this size is specified, any other size that builders might have handy, can be utilised; but there seem to be millions of 6-B.A. bolts and nuts still floating about, "surplus" from the war period (somebody gave me a jar full a little while ago, some plated, some tinned, and some rustless) that I thought maybe we might use up a few, as they are O.K. for jobs like this.

Reversing-rod or Reach-rod

This rod goes straight from the lever to the reversing-arm on the weighbar shaft above the valve-gear. The lever end is a plain eye; the forward end is an offset fork which engages with the reverse arm. There is no need to cut the whole rod from the solid; a piece of flat steel rod of $\frac{1}{8}$ in. by 3/32 in. section can be used, with a boss brazed on at the back end, and a block brazed on at the front end, which is machined up to form the fork or clevis. The actual length of the piece of rod would be approximately $6\frac{3}{8}$ in. The little block at the front end is $\frac{1}{2}$ in. long, $\frac{1}{4}$ in. wide, and 5/32 in. thick. Tie it in place with a piece of iron binding wire; apply a little wet flux, blow to bright red, and touch the joint with a bit of thin brass wire. Quench in cold water; then drill and slot the piece exactly as described for the forked joints in the valve-gear, and file it up to the shape shown in the illustration.

The boss at the lever end is made by chucking a piece of $\frac{1}{4}$ in. round steel rod, facing off, centring, and drilling with No. 30 drill for about $\frac{3}{16}$ in. depth. Part off a slice about 5/32 in. thick; reverse in chuck, and face the parted-off side to bring it to the required $\frac{1}{8}$ in. Next, get the actual length of rod between centres. Put the lever exactly vertical, and set the reverse-arm on the valve-gear in such a position that the die-block is exactly in the middle of the link opposite the trunnion-pin. Now take the measurement from the centre of the pin in the lever, to the centre of the hole in the reverse-arm, and that is the dimension you want. Set the loose boss against the end of the reversing-rod, and check the measurement between the centre of that, and the hole in the fork. If it doesn't come right, file a little off the end of the reversing-rod until you get it. Then very carefully, braze the boss to the rod by the method already described; quench in water, clean up, and the rod is finished. It may appear a little on the fragile side for a $3\frac{1}{2}$-in. gauge engine,

but there is no need to make a huge clumsy thing, such as I used to see at clubs and exhibitions. The rod cannot whip, as it will go through a tube in the tank. Slip the boss over the pin in the lever, and secure with a commercial over, with the wheels in any position, without hesitation or signs of binding, you can reckon you have made a good job of the whole issue. A little wire spring hooked over the pins in the trigger and latch block, complete the job; one



Reversing-rod or reach-rod

nut and washer; put the fork over the reverse arm, and fix that with a little bolt made in the same way as those described for the valve-gear. The offset of the fork is on the outside, so that the rod is parallel to the frame, as near as makes no odds, as our rural friends might say.

How to Locate the Notches

First we have to get both sides of the valve-gear exactly in unison. Set the die-block on the lever side exactly in the middle of the link, as stated above, then see if the die-block on the other side is also in the middle. If not, adjust until it is; then pin the arm to the shaft by drilling a No. 53 hole through the lot, and squeezing in a bit of $\frac{1}{16}$-in. silver-steel, or 16-gauge spoke wire. Now push the lever as far forward as it will go, and turn the wheels in a forward direction by hand. If the lever doesn't move, note where the latch is resting on the stand and sector-plate, carefully mark the spot, and file a notch which is a good fit for the latch. A watchmaker's flat file, or a key-cutter's warding file, will do the trick. If the lever *does* move, it will go backwards very slightly; file your notch at the point where it comes to rest. The same procedure is followed for the back gear notch, turning the wheels backwards. Having got the two full-gear notches, file another one for midgear, with the lever vertical, and the die-blocks in the middle of links. Then finally file four notch-up notches, two on each side, spacing them $\frac{1}{16}$ in. apart, as shown in the drawing of the complete assembly. If the lever goes full made from 28-gauge tinned steel wire, is just right.

How to Set the Valves

There is precious little to be done in the way of valve-setting. Merely take off the steam chest covers, turn the wheels by hand with the lever in the middle notch, and watch the valves. If you see the edge of the port just showing as a thin black line at each dead centre, the setting is correct. If one edge shows, and not the other, adjust the valve by taking out the pin at the top of the combination lever, and turning the fork. If neither edge shows, the valve is too long; file a shade off *both* ends, to keep the cavity in the middle. When the valves crack the ports, as the enginemen would say, at each end of the movement, the valve setting is correct; you can put the covers on, with jointing washers, "for keeps." You don't have to bother about port openings, cut-off, or anything else; the valve-gear itself looks after that part of the business. It is your humble servant's job to arrange matters so that it does; and that is why most beginners are absolutely astounded when they get up steam for the first time, and the engine kicks off without the least trouble. From my correspondence, I gather that nine-hundred-and-ninety-nine out of every thousand locomotive builders would rather work to guaranteed instructions, or adapt them to their own engines, than "wander off the track" with the near-certainty of complete failure; and the odd one never does it again!

Locomotive Drawings and Castings

MESSRS. BOND'S O' EUSTON ROAD are now supplying some drawings, castings and parts for a 2½-in. gauge reproduction of the very popular L.M.S. Class 5 4-6-0 tender locomotive. The drawings comprise fourteen sheets covering the general arrangement of engine and tender, frames, wheels and all details, carefully and methodically set out. The draughtsmanship is clear and accurate, and we feel that these drawings can be worked to and followed with confidence and without difficulty by anybody.

The castings and parts are of excellent quality and should present no difficulty to anyone possessing the necessary workshop equipment for machining them. Some of the more tricky items can be purchased with all machining already done, if required, at a slight extra cost. We commend all these products to the attention of anyone who requires a good 2½-in. gauge locomotive at a reasonable cost.

*A Sawing and Filing Attachment for the Lathe

by "Ned"

THE attachment is driven from the lathe by the crank shown herewith, which embodies a cast crank disc with an integral balance weight, and a slot for adjustment of crank throw. As already mentioned, the crank journal can be made [redacted] shown, to be gripped in the self-centring chuck, or altered to suit any other convenient method of mounting. The crankpin is drilled through the centre and counterbored to take a ¼-in. socket head high-tensile screw of the Allen type, and the inner end is squared to fit the slot of the crankpin.

A loose nut, similarly squared on the end, is inserted in the slot from the other side, and the thrust of the screw is taken against the shoulder of the nut and also that of the crankpin. This method of fixing has proved entirely satisfactory for adjustable throw machine cranks, and there is no tendency to slacken the screw when running in either direction, as the torque is taken by the squared end of the crankpin. No provision is necessary for retaining the big-end of the connecting-rod against endplay on the crankpin, as the relative positions of the driving crank and the attachment are adjusted when it is fitted to the lathe, and by leaving the end of the crankpin open, setting-up is simplified, and it is only necessary to see that there is [redacted] slight amount of endplay allowed between the shoulder of the crankpin and the eye of the connecting-rod.

Standard

This consists basically of [redacted] simple angle bracket, the base of which is adapted to bolt on the cross-slide of the lathe, and the front face carries the guides for the sliding member. Both these surfaces should be truly flat, and square with each other ; it is quite possible to carry out the required work on them by filing and scraping alone, if one objects to the trouble involved in setting them up for machining. But in most cases it will be found more satisfactory and much less laborious to machine them, and this can be carried out on a 3½-in. gap-bed lathe, if a fairly heavy angle plate is available for mounting the castings. Setting-up is simple, as centralisation is unnecessary, but in each of the two positions it is desirable to set the entire assembly so that it is fairly well balanced, and the faces to be machined should be set [redacted] squarely as possible to the lathe axis.

The base surface should be machined first, the lathe being run at the slowest back-gear speed, at least for the initial roughing cut, using a stiff round-nosed or angular tool with little or no top rake. It is advisable to take a deep enough cut to get well under the skin of the casting right away ; this will put [redacted] heavy torque strain on the work, and it will be found necessary to clamp both the work itself and the angle plate very firmly. Should there be any difficulty with this owing to the shape of the casting, it is permissible to drill one or two more holes in the vertical face of the bracket to take clamping bolts ; if these cut into the face of the slide bearing, they will do no harm, and may even prove useful for introducing oil to the slide when the parts are assembled.

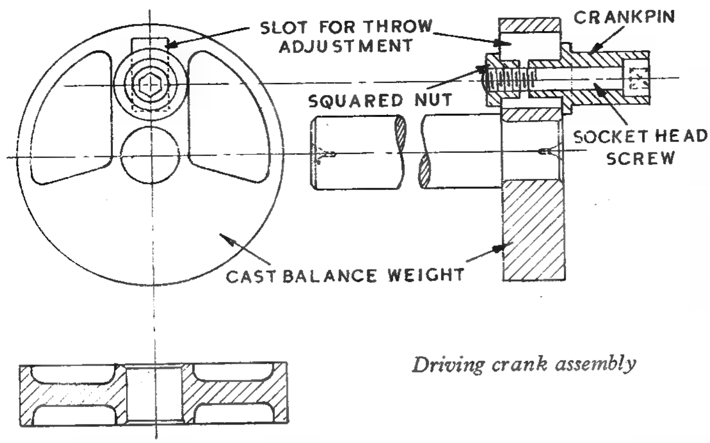
An alternative method of machining the surfaces is to bolt the standard to the cross-slide of the lathe, with suitable parallel packing to adjust to a convenient height, and use a single-point cutter or large face mill running in the chuck. This may prove a way out of an apparently insuperable difficulty if no suitable angle plate is available for mounting the work on the faceplate, or the gap of the lathe bed is too small to allow the assembly to rotate.

When machining the vertical face, the slots in the base surface (if cored in the casting) will be found useful for mounting the casting on the faceplate. If any tendency is found for the work to spring at the top end, [redacted] piece of wood packing may be interposed to steady it, but it should not be fitted so tightly as to force the casting out of truth. As it may be found difficult to produce [redacted] sufficiently high and accurate finish on the flat surfaces by means of the turning tool, scraping is desirable for the finishing process, using [redacted] surface plate and marking pigment to check accuracy in the usual way.

The best way to machine the seating for the swivel bracket, on the inner side of the standard, is to mount the casting on an angle plate on the lathe cross-slide, and use rotating cutters in a boring bar or other suitable holder. That is, of course, assuming that the lathe available is not large enough to swing the casting from a point ⅜ in. above its top, which represents the centre of radius of the groove which is machined in the face. The angle plate should first be mounted dead square with the lathe axis—the faceplate may be used as [redacted] reference face for gauging its position, using calipers, parallel slips, or feelers to check parallel accuracy—and the casting mounted on its side with the centre-line exactly level with the lathe centres.

A single-point cutter may then be used to face the surface of the casting, [redacted] far [redacted] permissible without cutting into the side webs. For cutting the groove, [redacted] right-angled grooving cutter is used, and if this is fixed in [redacted] ¾-in. boring bar, the latter should just touch the top end of the casting when the groove is being cut. It is not advisable to use [redacted] cutter wide enough to form the slot completely at one cut ; half the width or even less is better, the cutter being reset for the inner and outer radii of the groove. If the boring bar is used as suggested, measurement of the radius of the cutter is quite simple, the distance of the cutting edge from the bar, plus half the diameter of the latter, being taken for the inner and outer

*Continued from page 617, "M.E.," May 4, 1950.



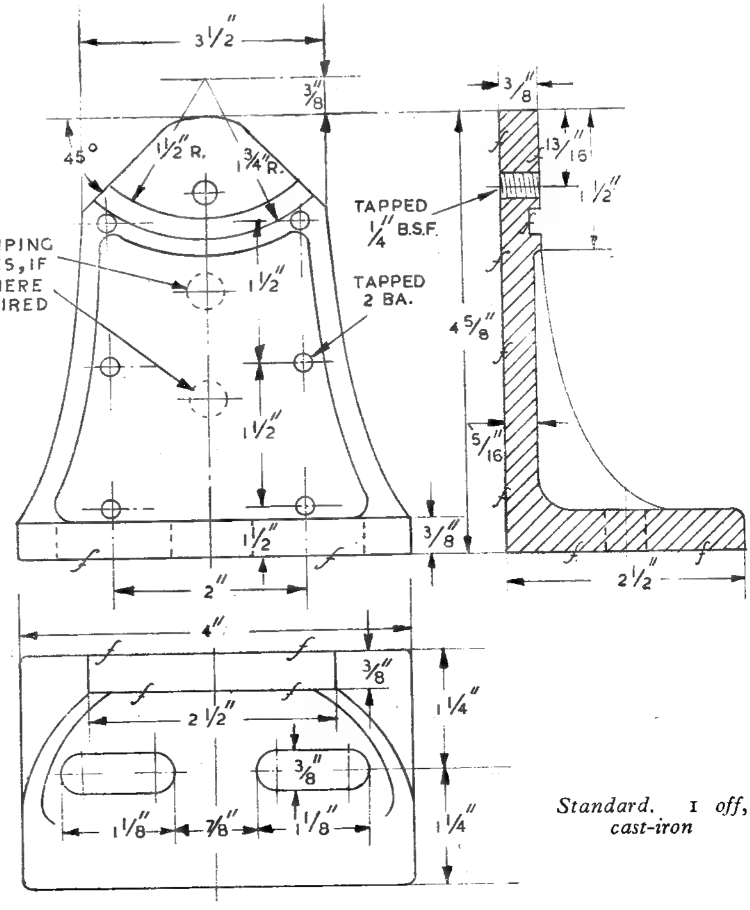
Driving crank assembly

sides of the groove respectively. The depth of the groove may be gauged by means of the lead-screw index, or a saddle stop fitted. Drilling of screw holes, etc., in the standard, may be deferred until other parts are made.

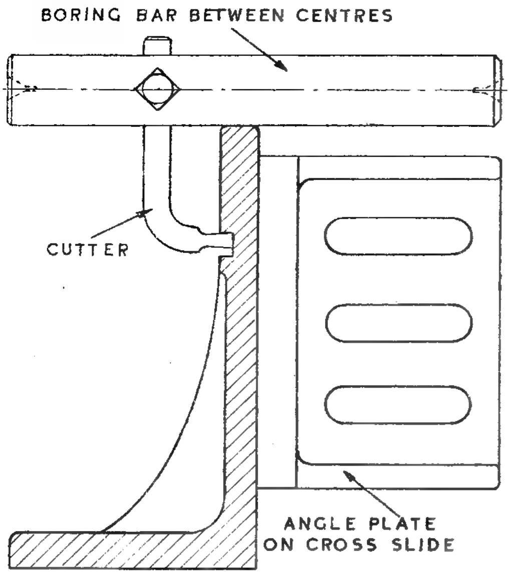
Swivel Bracket

This also calls for facing operations on the two sides, which may be carried out by similar methods to those employed for the former components, but being smaller, the casting is much easier to handle. The top surface should be machined first, only a plain facing cut being required; and when resetting the casting for machining the vertical surface, it is necessary to locate it in the correct position to machine the rim, at the correct radius to fit the groove in the standard. It will be seen that the centre point of this radius is outside the top surface to an extent equal to the thickness of the saw table, the object of this being to ensure that when the table is swivelled, the hole or slot in the table does not foul the file or saw.

To set the casting up for this operation, it should first be clamped to the angle plate, with its face overhanging the front of the latter just sufficiently to allow of machining, without fouling the plate. A punch mark is made in the front edge of the latter, representing the position of the machining centre, as checked by measurement from its reference face, and also by means of dividers from the casting, allowing for the amount to be machined away. The angle plate is then set up on the faceplate so that the punch mark runs dead truly, and machining is then carried out, radial measurements being, of course, taken from the punch dot. In this way it will be quite easy to ensure that the raised rim fits neatly in the groove of the standard, and slides freely in it for the purposes of angular adjustment,



Standard. 1 off, cast-iron

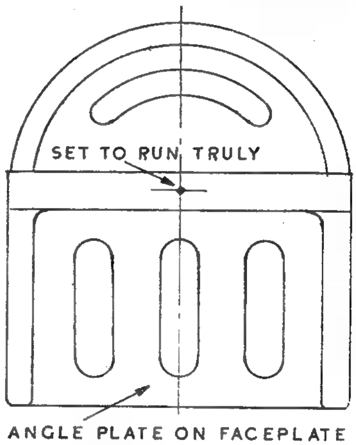


Method of machining semicircular groove in standard (plan view)

although the actual pivoting centre is outside both parts. The depth of the groove should be slightly greater than that of the rim, so that the bearing contact is made on the flat surfaces when they are clamped together by the set-screw. It may be found necessary to file the slot in the swivel bracket to ensure that it does not interfere with movement by fouling the set-screw.

Bow or Saw Frame

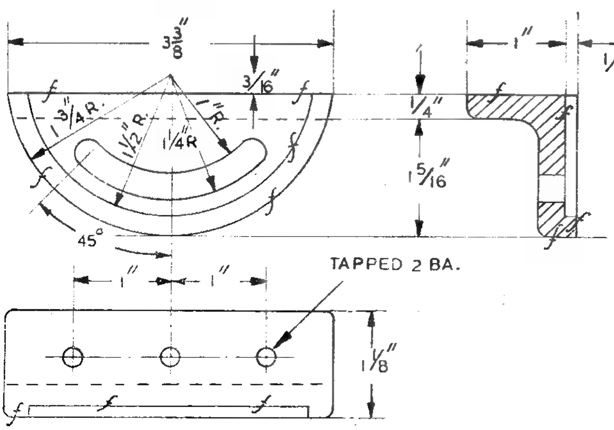
An aluminium alloy of good quality is recommended for this part, owing to the necessity of keeping the reciprocating weight as low as possible. Very little machining is necessary on this part, practically the only operation being the drilling of the holes in top and bottom lugs to take the tension adaptors. The position of these holes should be marked out on the end faces, then centre-punched, and started by means of a small pilot or centre-drill. It is desirable to fit a wooden stretcher across the mouth of the bow to prevent any tendency for it to spring inwards while drilling, but it should not be so tight as to spring the bow outwards. The drilling operation may be carried out in the lathe, by running the drill in the chuck, and resting the lug at one end of the bow against the back centre, locating it by means of the pilot hole. An undersize hole should first be drilled—in the absence of the correct



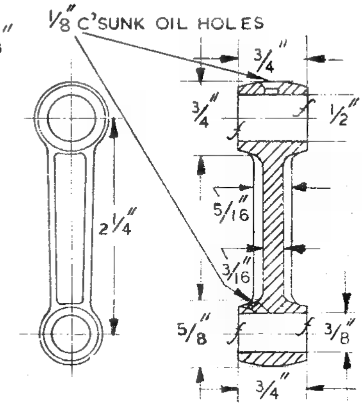
Method of setting up swivel bracket for machining semicircular rim

¼ in. reaming size, a 15/64-in. drill may be used —and then followed up by a ¼-in. reamer, applied in the same way. The lower lug is then counterbored, and the top lug spot-faced.

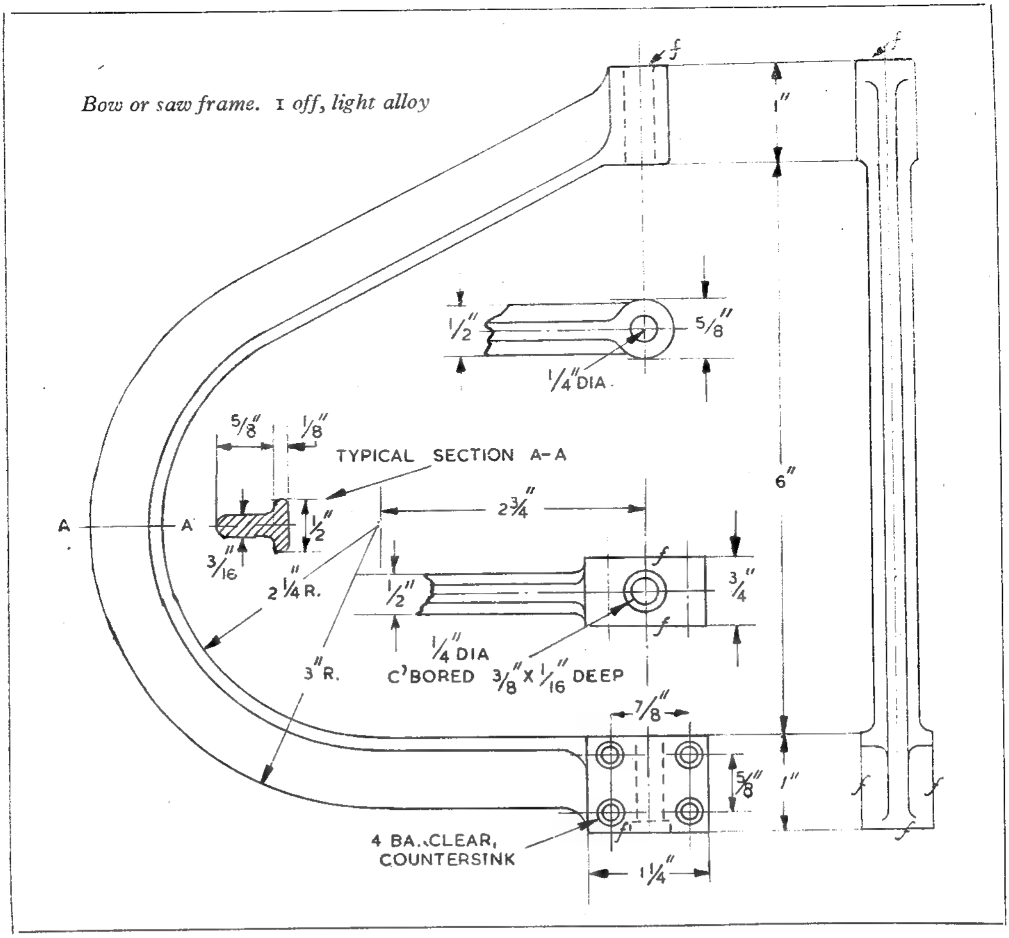
It should now be possible to pass a ¼-in. rod, such as a straight silver-steel bar, through both lugs, after removing the stretcher piece, and this bar may be used as a reference gauge when filing or machining the sides of the lower lug to ensure that these surfaces are truly parallel



Swivel bracket, 1 off, cast-iron



Connecting-rod, 1 off, bronze



with the axis of the holes; the inner side which bolts against the slide is, of course, the most important. Finally, the four holes by which the bow is secured are drilled and countersunk in the lower lug.

In the absence of a casting, it would be possible to fabricate the bow from T-section light alloy, the lugs being welded on, but this calls for considerable skill in the bending and welding of light alloy; it would, however, enable the weight of the component to be reduced without any sacrifice of strength.

Connecting-rod

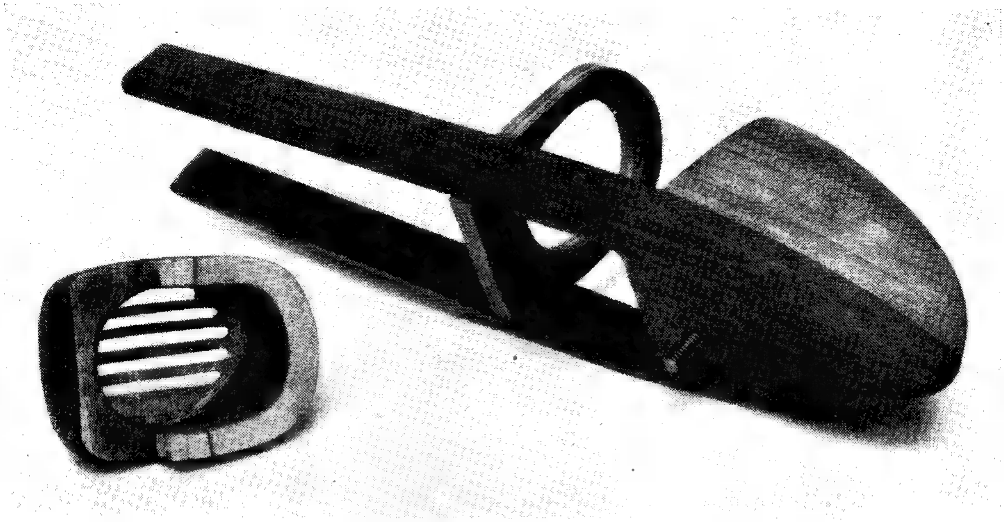
Bronze or gunmetal is recommended, but cast-iron is almost as good; aluminium alloy is permissible though inferior in wearing properties, but bushing of the eyes would eliminate this disadvantage. The dimensions of the rod are not critical, but it is essential that the eyes should be exactly parallel with each other. A method of machining to ensure this, which has often been recommended in THE MODEL ENGINEER, is to clamp the casting to a fairly substantial piece of flat steel bar, by means of a strap across its centre and two set-screws (which must not project beyond the back surface of the bar), then set up the latter on the lathe faceplate, so as to bring each of the eyes in turn to the central position for drilling, boring and facing. The reverse faces of the eyes can be machined by mounting the rod on pin mandrels of appropriate size.

To ensure a good bearing surface, the bores should be finished as accurately and smoothly as possible by tool-boring or reaming. All that remains then to be done is to drill and countersink the two oil-holes in the top and bottom ends, after which the burrs inside the bores should be carefully scraped away.

It may be remarked that in the experimental attachment a bakelite connecting-rod was used very successfully; the material used was a high-tensile laminated fabric board such as an appropriate grade of Tufnol or Paxolin. One of the advantages of this material is its shock-damping properties, which enable the rod to work very smoothly and silently; it is also self-lubricating to a certain extent, so that a mere trace of oil is sufficient for long periods of running.

(To be continued)

MODEL CAR NEWS



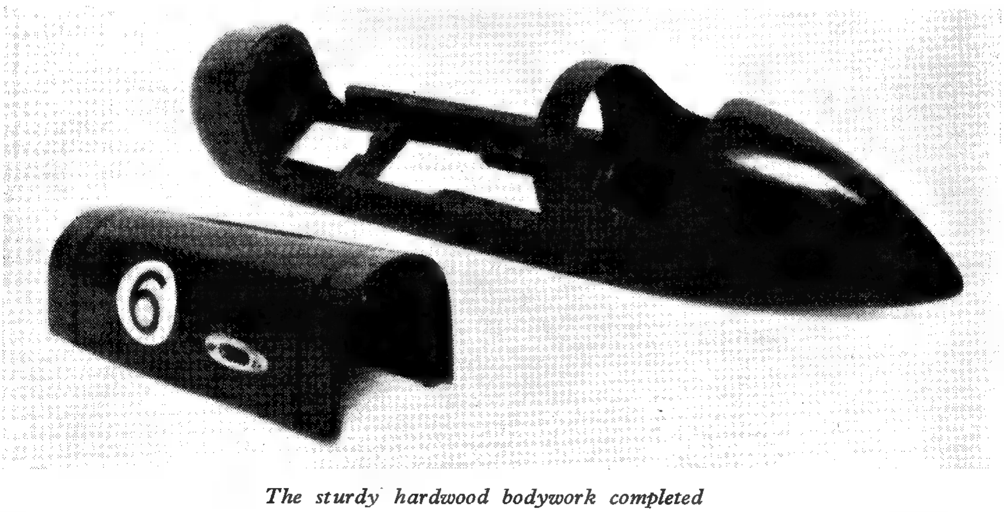
Mr. A. Galeota's small experimental model race car in the initial stages of construction

A Small Model Racing Car

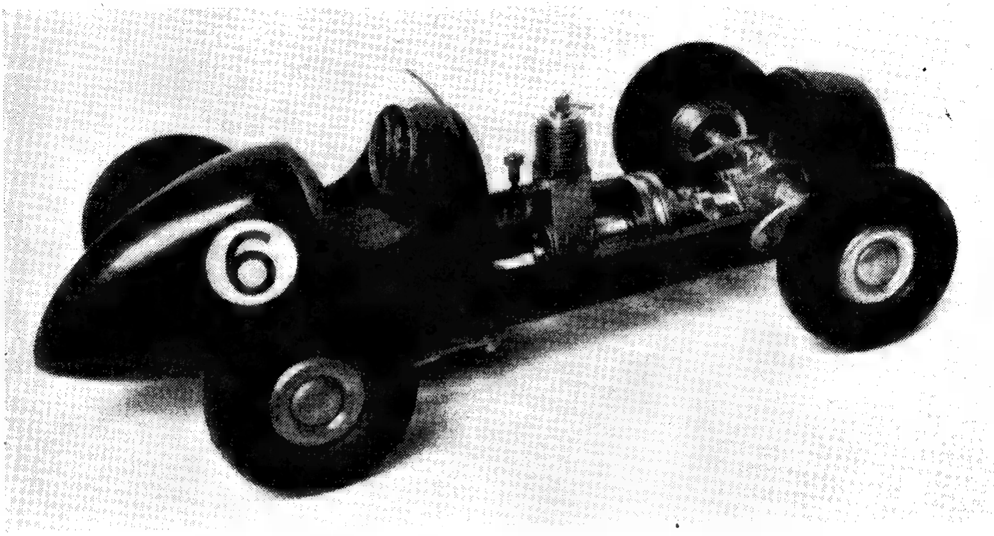
by A. Galeota

THIS model was designed and built to be powered by small compression-ignition engines. It is made entirely of hardwood, and is very strong and realistic in appearance. My method of construction is quite simple and it can be applied to various prototypes. Although a freelance design, it is closely reminiscent of full-size practice, and beginners could try their first attempts at building a model car with a minimum of cost. The design is particularly suitable for engines mounted vertically.

The power unit is a Mills 1.3 c.c. with direct drive. The gearbox was machined from castings made by "1066 Products Ltd." and is fitted



The sturdy hardwood bodywork completed

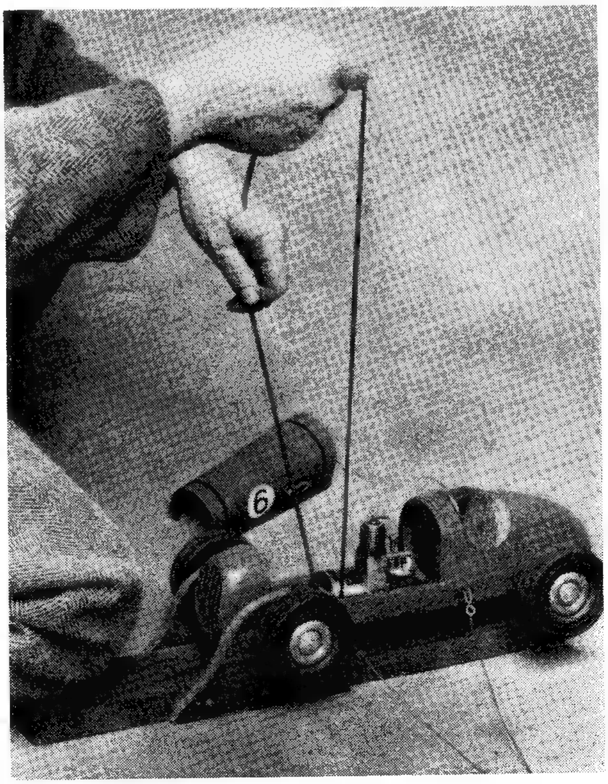


The author's experimental model car, showing engine layout with bonnet off

with bevel gears of 2 to 1 ratio running in oil. The drive is taken to the nearside wheel only, the offside running free.

The 3-in. wheels are fitted with solid tyres and the axles are made of $\frac{1}{4}$-in. silver-steel. The rear axle plate is made of $\frac{1}{8}$-in. dural sheet and is underslung; it is adjustable for steering and can be quickly removed. The model is 15 in. overall, $2\frac{3}{4}$ in. wide and $3\frac{1}{4}$ in. high. The track is $6\frac{3}{4}$ in., wheelbase $9\frac{1}{2}$ in., weight 3 lb.

The chassis was made from a mahogany block 15 in. × 3 in. × 1 in. The outside contour was shaped first, then the inside was cut out up to the back of the cockpit, thus leaving a solid block at the tail portion. A $\frac{1}{4}$-in. bolt was screwed through this block to retain the rear axle assembly, and several layers of $\frac{3}{4}$-in. soft wood (not balsa) were cemented in place after being hollowed and roughly shaped, to form the tail of the model. A central former of about $\frac{5}{16}$-in. hard ply was cut to shape and cemented in place.



Simple method for starting up the engine single-handed on the track

The cockpit was next completed by cutting a thin sheet of ply to the required pattern and cementing in place over the former and to the rest of the bodywork; a rebate was left to accommodate the bonnet all along the front edge of the former. A seat was fitted, shaped from two

A three-quarter view of the model photographed on the track

separate blocks of balsa wood and upholstered with thin coloured leather to match the colour scheme of the model (red). A dummy steering wheel, dashboard with dummy instruments, and Perspex windscreen were fitted, as shown in the photographs.

The radiator block was built up from several layers of medium hardwood, each layer being hollowed before cementing. It was fixed to the chassis and then finally finished off. The grille was cut from $\frac{1}{16}$-in. aluminium sheet by means of a fretsaw, and is firmly wedged into the radiator block. A rebate was also cut to accommodate the bonnet.

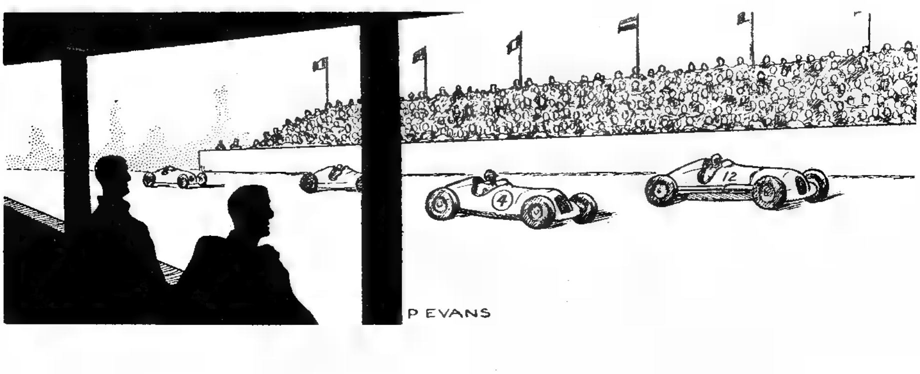
The bonnet consists of a thin piece of ply, easily bent and cemented over two U-shaped $\frac{1}{8}$-in. formers and reinforced internally at the lower edges with two longitudinal $\frac{1}{4}$-in. $\times$ $\frac{3}{16}$-in. strips, $\frac{1}{8}$ in. was left extending at both ends of the formers to fit snugly on to the rebates. The engine bearers are made of hardwood and are clearly visible in the illustrations.

The model was finished with two coats of grain filler and six coats of red cellulose paint, rubbed down after the first two coats.

For starting up single-handed, I have constructed a stand on which the model is firmly supported, as can be seen in the photograph, and in this way I can hand-launch the car, time after time, without trouble.

Considering the power of the engine, we may say that this model is rather on the heavy side, on account of solid tyres and semi-solid construction; but as it is an experimental model I intend to fit a more powerful engine in the future for higher speed. Meanwhile, on a concrete circuit of 20 ft. diameter, 27 m.p.h. have often been exceeded. She is a consistent runner and keeps steadily to the track. In spite of the direct drive, she always comes to a standstill with a graceful, smooth inside skid.

After a whole year of continuous running, no sign of wear can be traced.



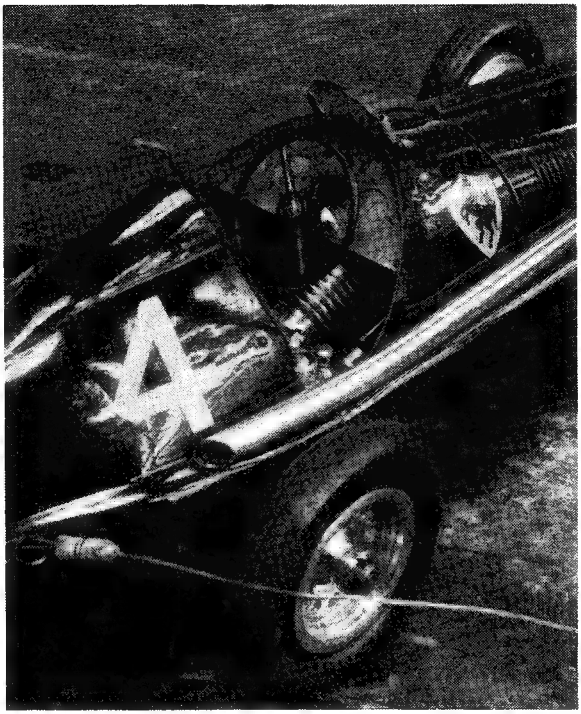
Here and There

by "Clubhound"

WELL, as I intimated last month, the curtain is going up once more on the miniature car racing stage and the 1950 season is getting well under way.

The Pioneer Model Racing Car Club's meeting at the New Royal Horticultural Hall on March 25th was highly successful, the event being won by Mr. Taylor's model powered by [redacted] 5-c.c. ETA. Mr. C. W. Field was runner-up with his 10-c.c. o.h.v. engined Alfa Romeo pictured here.

A highlight of the occasion was the visit of the B.B.C. to make a recording which was later that evening broadcast in the Radio Newsreel programme.

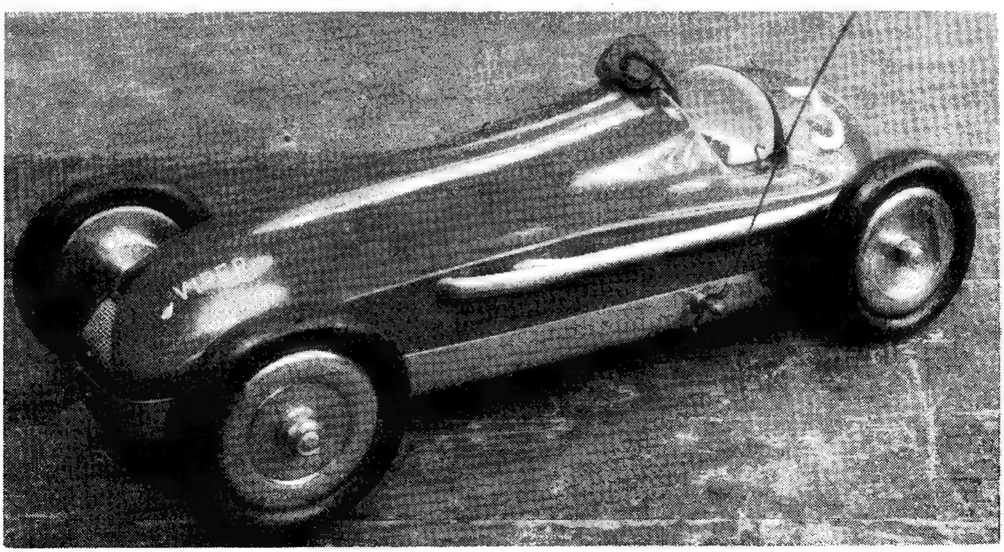


Showing the cockpit layout of C. W. Field's 158 Alfa Romeo

Two interesting new models which attracted much attention were B. P. Winter's 5-c.c. ETA-engined Alta and G. A. King's *Viper*, illustrated here.

The Bolton boys have been putting in [redacted] spot of useful spadework on their track in readiness for the open event which will take place on June 21st. Having followed the construction of this circuit from its earliest days I am perhaps in a position to say that it should be one of the finest in the country when this latest modification has been completed.

Had [redacted] really



Mr. G. A. King's latest brain child "Viper" looks [redacted] though it might quite easily pack a punch

Mr. Douglas Willis, Radio Newsreel reporter, with microphone, interviews Mr. F. C. Hird, hon. secretary of the Pioneer M.R.C.C.

interesting few days in Dundee recently and was afforded the opportunity of inspecting their circuit. Truly an ideal spot from every sense of the word, complete with a rip-roaring panorama of the Tay bridge and lots of water to cool any wagon that might accidentally catch fire. The members are top hole and look forward to seeing some of the "pushers" from this side of the border at their June 18th rendevous.

Everyone kept very quiet about Easter Monday and even my best pals refused to squeak. Seems as though the weather man was out with his watering cans. See what I mean, chaps? Appears as though he couldn't distinguish the breed from prize turnips! Anyhow, it was bad luck and I hope that all who were disappointed will have lots of opportunity during the season to make up for lost time—and sunshine.

After two years' strenous work by their worthy chairman, Mr. C. Alford, The Plymouth Model Car Club held their first track meeting on March 31st. There was plenty of enthusiasm shown by all present and two silver cups were presented to the club for annual competition. Come on, all you enthusiasts in the Plymouth area, now is your chance to show what you can do! You are invited to contact the hon. sec. Mr. S. R. Emond, at 52, Efford Lane, Laira, Plymouth, who will give you all the necessary dope.

The sport caused quite a sensation at the Harrogate Model and Experimental Engineering Society's annual exhibition on April 12th when, so I am told, speeds up to 70 m.p.h. were demonstrated. The president, Alderman C. J. Simpson, who opened the exhibition in Christ Church School, Harrogate, intimated that the society hoped to use an open-air track at Penny Pot Lane this year.

Once again don't forget the coming events—here they are for this month and next: May 21st, Bolton Open; May 28th, Eaton Bray (Austin Trophy); May 29th, Sunderland Open; May 29th, Chiltern Open; June 4th, Ossett Open; June 18th, Eaton Bray (Drysdale); June 18th, Dundee Open.

Grand Prix driver Bob Gerard is getting really enthusiastic about the miniature side of his sport and has set up a new track record for the Leicester Mini Club, of which he is president, at 81.08 m.p.h. in the 10 c.c. class. The motor used was a McCoy, mounted in a "bitza" chassis, but I have heard tell that he has a British unit up his sleeve somewhere and when he brings it out it is likely to go places!

The Surrey club are still looking for a suitable venue for a track. Up to the time of writing they have been most unfortunate in their quest and I cannot help but feel that some of our readers might be able to offer assistance in this matter. Any bright ideas should be addressed to the Hon. Secretary, Mr. C. M. Catchpole, 26, Rutland Court, London, W.3.

Club chairman, Mr. J. Clayton of the Bolton and District S.M.E., does a bit of levelling-out before placing the concrete

Siemens Brothers & Co. Ltd., of Woolwich, are last but by no means least on the map this month with an ambitious programme for their very active model car section. After many months of hard work, they have completed the construction of two tracks, and the erection of a safety fence is now in progress. Their opening date will shortly be announced and I am sure that all other miniature racing enthusiasts will join with me in wishing them the very best of luck and good motoring.

A Miniature Motor Coach

THE accompanying photographs illustrate one of two miniature motor coaches, built by Mr. E. Johnstone, of Brighton, which are in service at Hastings amusement park. They are one-quarter full-size, and for working models are remarkably complete and accurate in detail. They are driven by 125-c.c. petrol engines, and have a maximum speed of about 28 m.p.h. They are designed to carry three juveniles, one of whom acts as driver. The steering wheel and controls in the driving cabin are dummies. The actual working steering wheel and controls are arranged in the body of the model for more convenient operation. The upper part of the rim of the steering wheel and the throttle control can be seen in the photographs, projecting just above the open "sunshine" roof.

Novices' Corner

Vice Clams

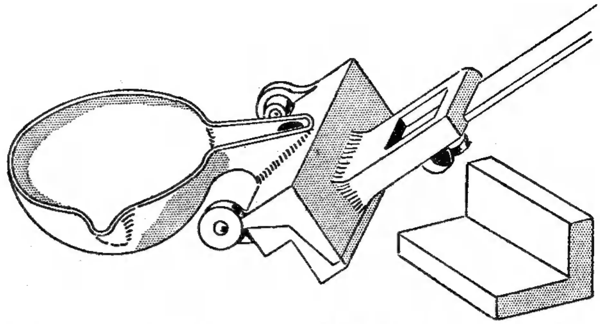


Fig. 1. A combined ladle and mould for casting lead vice clams

ALTHOUGH it is customary to furnish commercial bench vices with serrated jaws, intended presumably to bite into the work and afford a firm hold, one of the first requirements in the workshop is to devise some means of protecting the work from the ravages of these hardened steel teeth. If a piece of bright mild-steel is gripped between jaws of this type, much heavy filing may be needed to remove the resulting indentations marring the surface of the metal. The serrated jaws, termed loose jaws, are fortunately detachable, and it is therefore possible, after removal, to have them ground flat in a surface-grinding machine. But this means extra expense, and the difficulties are usually overcome by using sheet metal covers, or clams, to shield the vice jaws.

Formerly, it was the practice to use lead clams, cast to shape in a special mould ; but as lead forms the basis of some successful anti-friction bearing metals, it can hardly be expected to afford a good frictional grip. Moreover, as these soft metal clams are easily indented and deformed, they usually require frequent renewal. A device for casting lead vice clams is illustrated in Fig. 1, where it will be seen that the metal is melted in a ladle which is then tipped to allow the molten lead to run into the attached mould. The drawing at the side shows the form of vice clam produced in this way.

Another type of mould, which forms a clam of similar shape, is that shown in Fig. 2. Here, a length of angle-iron forms the base portion of the mould, and the sides are built up with

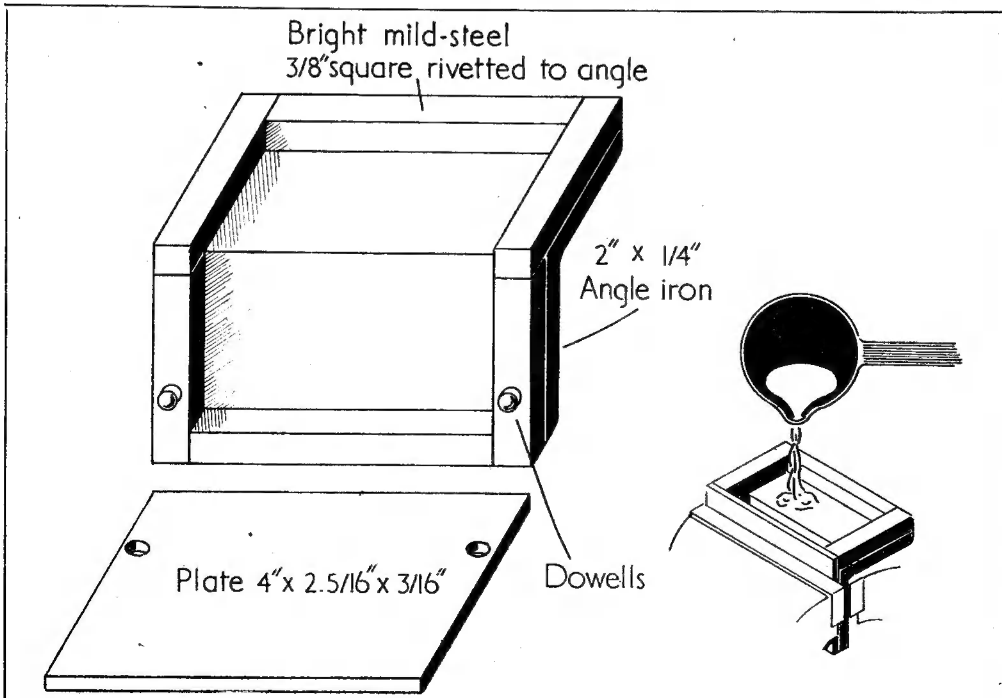


Fig. 2. A mould for making lead clams

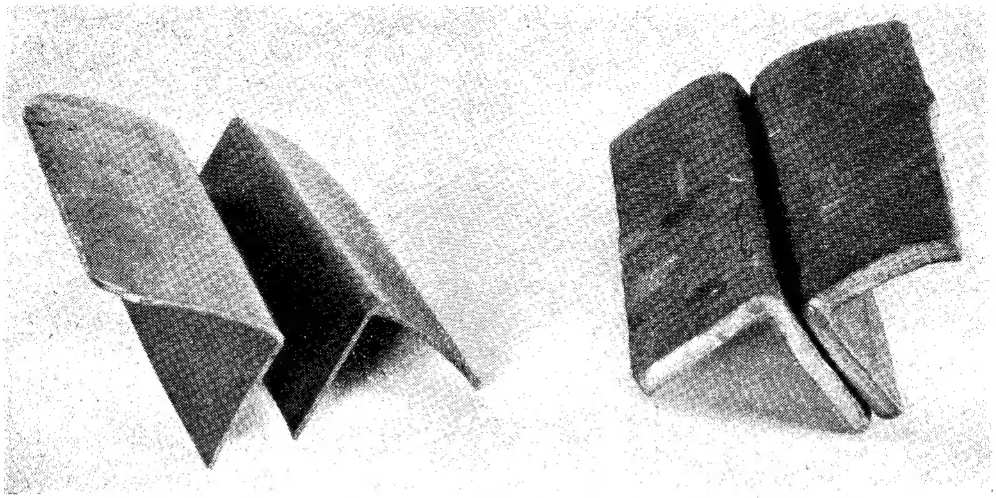


Fig. 3. A pair of sheet copper clams—left, and sheet lead clams—right

pieces of square steel bar. The front cover-plate is located by means of dowels, and, when in use, the appliance is gripped in the vice ready to be filled with molten lead.

On the whole, it is usually more convenient to make these soft clams from strips of thick sheet lead ; these, after being cut to size, are gripped upright in the vice, and the projecting portions are then hammered down with a wooden mallet to lie flat against the upper surface of the jaws. Sheet copper will, however, usually be found a better material for making vice clams, and these are bent to shape in the same way as the sheet lead variety ; but, to avoid injury to the hands when using the vice, all sharp corners should be removed from copper clams.

It should be borne in mind, however, that metal filings tend to become embedded in the copper and these may then cause damage to the surface of finished work ; it is advisable, therefore, to brush the gripping surfaces of the clams clean, whenever the work is re-gripped in the vice during filing operations. A pair of lead clams, and a pair of sheet copper clams are shown in Fig. 3. For holding fine work, a vice fitting like that illustrated in Fig. 4 is sometimes used. The brass jaw-pieces are held apart by coil springs and move on steel guide-bars fitted with bushes. The appliance is very accurately made and highly finished, but the only clue to its origin is the letters C.W.Z. stamped on one of the jaws.

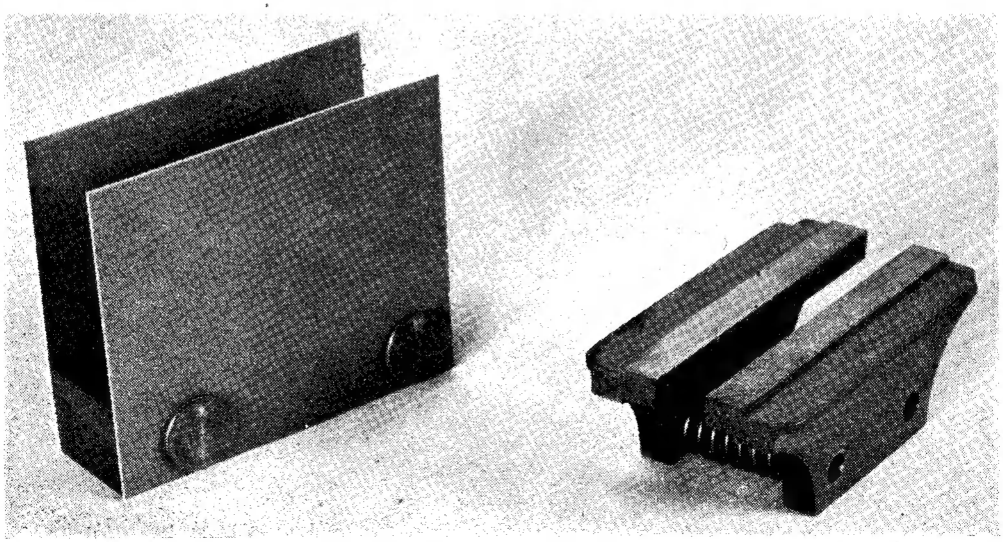


Fig. 4. Cardboard vice clams—left, and a device for clamping small work—right

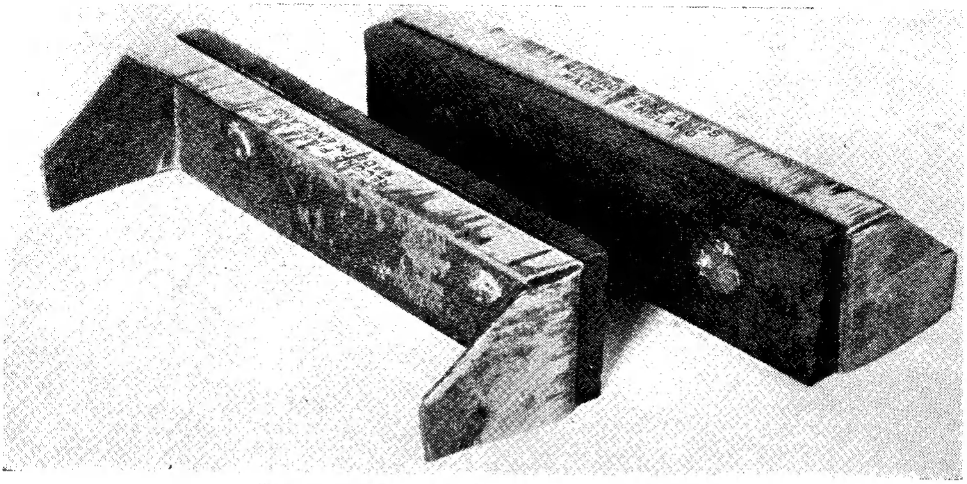


Fig. 5. "Record" fibre-faced vice clams

For all-round use, the pair of clams illustrated in Fig. 5 will be found most serviceable. These fittings are of "Record" make, and the thick fibre pads are attached to a sheet-metal casing which enables the clams to be sprung into place and retained on the vice jaws. As has already be mentioned, any metal filings adhering to the vice clams may damage the surface of the work; therefore, as an additional precaution, it is advisable to protect highly finished work surfaces with strips of cardboard. The card may be merely bent over so as to enfold the work, or a special holder can be made for the purpose, similar to that illustrated in Fig. 4 which shows two pieces of card attached to a wooden base with drawing-pins; the wood strip stands on the base of the movable jaw and the card extends as far as the upper surface of the vice jaws. Although cardboard clams may not last long when used to grip irregular work, they can, at least, be easily renewed.

When cutting a screw thread on a rod held in the vice, it may be found difficult to keep the work from turning, even if the vice jaws are forcibly closed; a better frictional grip, and one requiring less pressure, will be obtained if a strip of abrasive cloth, with its rough surface inwards, is wrapped round the work. Great care must be taken, when gripping threaded work in the vice, not to damage the actual screw threads. This difficulty often arises when making studs, and the pressure required to hold the work between ordinary clams may be sufficient to cause damage. To obviate this, use can be made of a special clamping device, such as a length of steel strip in which a tapped hole to receive the stud has been formed. A slit is then made with a hacksaw into the hole, so that, when the vice jaws are tightened, the holder will close on the work and grip the threads securely without causing damage.

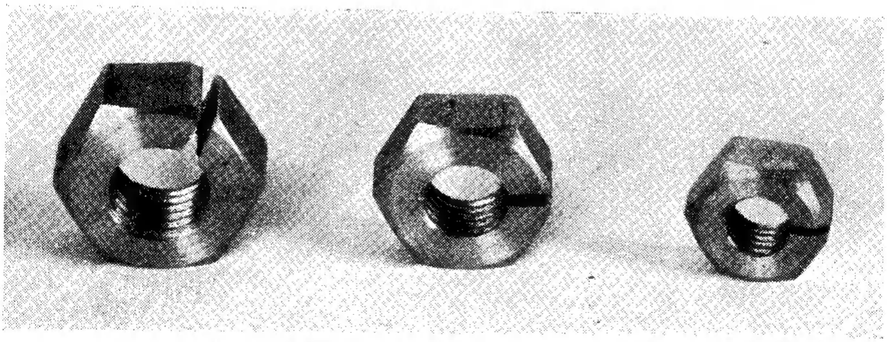


Fig. 6. A set of clamp-nuts for B.S.F. threads

An alternative method, and one commonly used, is to take a nut with a corresponding thread and slit it with a hacksaw from one corner into the bore; this enables the nut to be closed and to grip firmly when pinched in the vice. A group of these clamp-nuts is shown in Fig. 6, and in course of time it will be found that the range of nuts accumulated will be sufficient for holding all ordinary work. Gripping tapered work in the vice without causing damage often presents some difficulty.

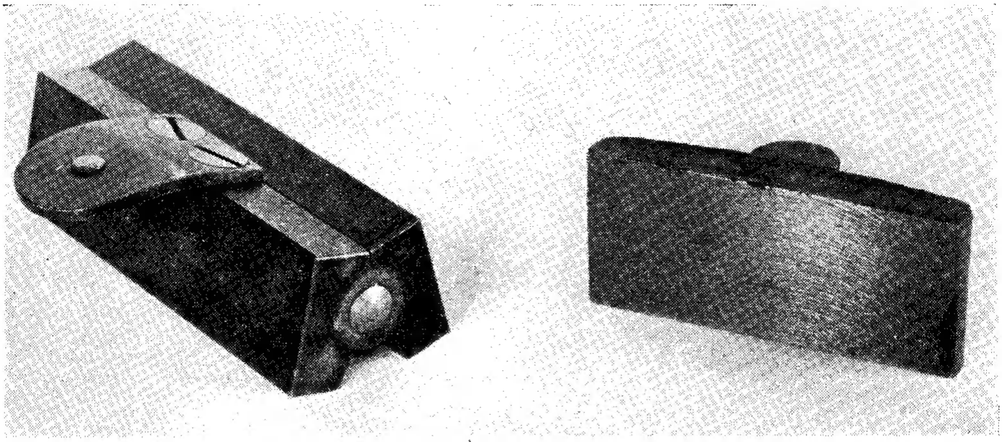


Fig. 7. The Starrett taper-locking device—left. The Myford swivelling vice jaw—right

Where the work is mounted in the vice with the taper lying in the horizontal plane, a swivelling jaw-piece, such as that shown in Fig. 7, will afford a secure hold when placed between the vice jaw and the work ; incidentally, the device illustrated is an accessory supplied with the Myford machine vice.

This form of swivelling jaw-piece can, of course, also be used to hold tapered work when the taper is set vertically, or, as an alternative, a fitting, such as the Starrett vice attachment, also illustrated in Fig. 7, can be employed for this purpose.

The latter appliance is attached temporarily to the vice jaw by means of a strap, carrying a peg which fits into a hole drilled in the vice casting. The spring-controlled movable jaw turns on a hinge pin, and can thus set itself to conform to the taper on the work when the vice jaws are closed.

PRACTICAL LETTERS

Stationary Steam Engines

Dear Sir,—I should like to endorse the ideas suggested in F.W.C.'s letter in the April 27th issue of The Model Engineer.

I feel convinced that if a corner could be found every week for the "Stationary Wallah," it would appeal to a much larger number of model engineers that is generally supposed.

I have been surprised to find how many people, even in these days of internal combustion engines, are genuinely interested in a stationary steam engine, and it has always seemed to me that the old mill engine with a cylinder of, say, 1 in. bore × 2 in. stroke, lends itself particularly well to modelling, being neither too large nor too small : producing a useful amount of power and, when in motion, being slow enough for every movement to be appreciated.

Yours faithfully,

Bridgwater. C. Gundry Lane.

The Early "Seal" Marine Engine

Dear Sir,—As an old reader of The Model Engineer, I was very interested in Mr. Edgar Westbury's reference to the above engine. As a matter of fact there is an illustration and short description of this engine in The Model Engineer of December 29th, 1904, p. 604, under "Some Motor Boats of 1904."

Seal also made small horizontal gas engines up to about $1\frac{1}{2}$ h.p. I personally knew "old man Seal" and had one of his $\frac{1}{2}$ h.p. gas engines for some time. The valve-gear was, as Mr. Westbury says, ingenious. There was no 2 to 1 gear in the ordinary sense, but the same object was achieved by fitting loose on the crankshaft a single-start worm with a cam-like hump on one of the threads—this worm had a peg on one side which engaged with a spring-loaded and weighted trigger on the side of a collar fixed to the crankshaft. This acted as a governor on the exhaust valve and when the speed got too high the trigger lifted by centrifugal force and ceased to drive the worm and so failed to operate the exhaust valve. The worm drove a worm-wheel of about eight teeth in the forked end of the exhaust valve push-rod, and to get the 2 to 1 motion every alternate space of the worm-wheel was cut deep enough to clear the cam hump on the worm. The inlet valve was automatic.

Yours faithfully,

Hanwell, W.7. N. H. Simmons.

[Some further information on this interesting engine has been furnished by another correspondent, and we hope to publish it in due course.—Ed., "M.E.".]